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Report on the crinoids collected from the Nansei Islands, southern Japan, during a cruise of the training vessel Toyoshio Maru in 1999 (Crinoidea)

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豊潮丸1999年調査航海で得られた南西諸島産ウミユリ類（ウミユリ綱）

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抄録：広島大学練習船豊潮丸による1999年生物調査航海中，南西諸島海域の9地点においてドレッジによる底生動物採集が行われ，うち6地点からウミユリ類標本約510個体が採集された．また2個体が潜水によって得られた．これらに関する分類学的調査の結果，ウミシダ目9科に属する46種が同定され，うち1新種*Decametra multicirrala*を含む6種は日本初記録と認められた．数種類では，未成熟個体が高率で見出された．

Abstract: Dredging surveys of benthos were carried out at 9 stations around the Nansei Islands, southern Japan, through a cruise for biological research of the training vessel Toyoshio Maru of Hiroshima University in 1999. During the cruise, a total of 510 comatulid specimens were collected at 6 stations and 2 specimens were collected additionally by diving. As a result of identification, 46 species belonging to 9 families of order Comatulida were revealed. Among them, 6 species including a new species *Decametra multicirrala* are new to Japanese fauna. The immature individuals were found at the high rate in several species.

Key Words: crinoids; comatulids; Echinodermata; taxonomy; new species; distribution; Nansei Islands; Japan.

This paper deals with comatulid crinoids collected from the Nansei Islands regeon through a cruise for the biological survey in 1999, from May 25 to June 4, of the training vessel (TRV) Toyoshio Maru of Hiroshima University.

In the early 20th century, two detailed taxonomical works were made by Gislēn (1922,1927), who revealed nearly 50 crinoid species collected from the western waters in Japan from Sagami Bay to Kyushu, including the Ogasawara (Bonin) Islands. Although (1922, 1927) did not treat the crinoids from the Nansei Islands, he had noted the extreme richness of crinoid fauna in Japanese waters.

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The Nansei Islands are consisted of two major island groups, the Satsunan Islands and the Ryukyu Islands. These are locating from off the south edge of Kyushu southward to the vicinity of middle Taiwan (Formosa). The Nansei Islands region is strongly influenced by the Kuroshio Current, and its fauna is characterized by the subtropical elements.

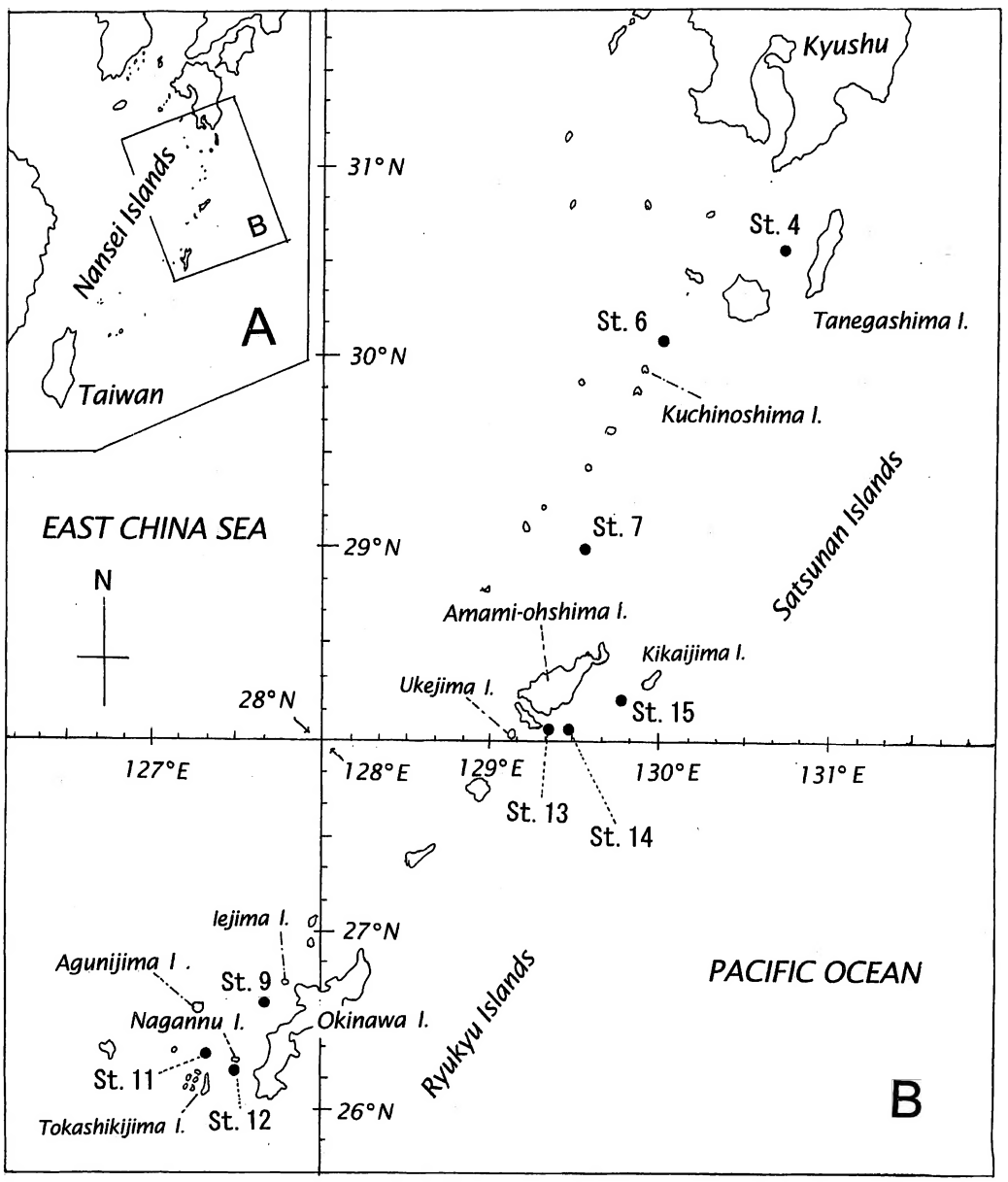

Fig. 1. Sampling stations in the Nansei Islands region. Black circles: dredged stations. (see 'Localities and Specimens' [p.40] for the detailed data.)

The first systematic work in this region was made by R. Tamura, University of Ryukyus, who reported 17 comatulid species from the shallow-water of Okinawa Island (Tamura,1983). Afterward, Y. Fujita of the same University, reported 25 species of shallow-water crinoids at Okinawa Island (Fujita, 1998). In the same year, Kogo revealed 114 species of Japanese crinoids, including 51 comatulids and 4 stalked crinoids from the Nansei Islands region and East China Sea (Kogo, 1998). Recently, Kogo and Fujita added three comatulid species from the shallow-water of Okinawa Island as new records to the Japanese crinoid fauna (Kogo & Fujita, 2000).

Materials and Methods

The 9 dredge stations during the cruise of Toyoshio Maru are shown in Fig. 1. The dredges were carried out using the ORI-typed dredge (ORI-Oceanographic Research Institute of the University of Tokyo; Fig. 2a) or an epibenthic sledge-net (Fig. 2b), or both according to the condition of bottoms. The dredges were towed for 5 minutes at the speed of 2 knots (dragged distance: ca. 300 m). After the crinoid specimens were sorted from the benthic samples, they were preserved in 70 % ethanol. All the specimens are deposited in the Osaka Museum of Natural History (OMNH Iv).

The classification in this study follows mainly the monographs by A. H. Clark (1931,1941, 1947, 1950) and A. H. Clark and A. M. Clark (1967), and also, in case of family Comasteridae, the revision by Rowe et al. (1986) and the key by Messing (2001). The morphological terms used in this text are referred to the 'Glossary of terms used in the description of a comatulid' by A. H. Clark (1915, pp. 59-107).

Results

A total of 510 comatulid specimens were collected from 6 stations (Sts. 6, 7, 9, 11, 12, and 13), but no specimen was found in 3 stations (Sts. 4, 14, and 15). Depths of the station where specimen were collected were from 50 to 346 m (average depth: 143.3 m). Besides them, 2 specimens were collected by diving from the southen shore of Agunijima Island, the Ryukyu Islands.

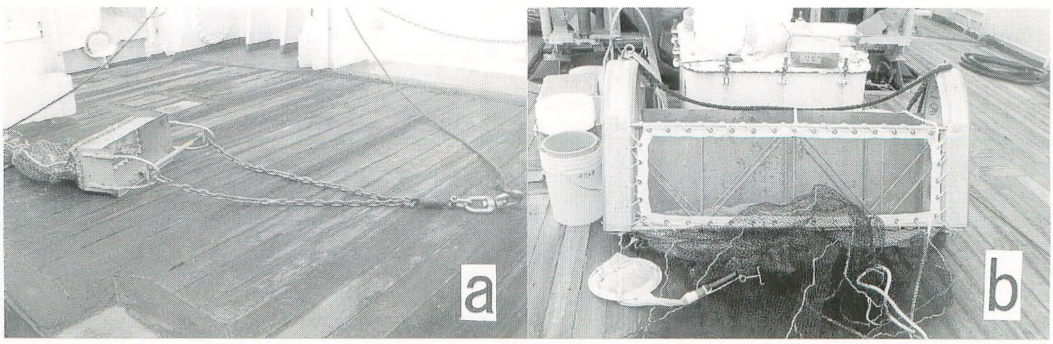

Fig. 2. Collecting instruments for benthos. a: dredge (mouth opening: 500 mm wide, 150 mm high; mesh size: 5 mm). b: sledge-net (mouth opening: 1450 mm wide, 326 mm high; mesh size of last part: 0.3 mm).

As a result of taxonomical study on the whole collection, 46 species belonging to 9 families of the order Comatulida were recognized, while several specimens were not identified accurately to the level of species because of their immature conditions. The stalked crinoids were not found at all. In those 46 comatulid species, the following 6 species, i.e. *Eudiocrinus venustulus*, *Oxymetra finschii*, *Mariametra vicaria*, *Decametra multicirrala* sp. nov., *Colobometra discolor*, *Euantedon sinensis*, are regarded as new records to Japanese waters. Resultly, the total number of crinoid species distributed in the region of Nansei Islands including the East China Sea is summed up to 63 species, i.e. 59 comatulids and 4 stalked crinoids.

The most notable station in this area is St. 12, South of Nagannu Island, 50-55 m in depth, where 33 species (including 286 individuals) were found. It occupies about 73 % of the species identified (56 % of total individuals) among the crinoid specimens collected during the cruise. This station is characterized mostly by the shallow-water comatulids.

Class Crinoidea

Order Comatulida

Suborder Oligophreatina

Family Comasteridae

1. *Comatella stelligera* (Carpenter, 1888)

Japanese name: Futoude-ogasawara-umishida

Actinometra stelligera Carpenter, 1888: 308, pl. 5 figs. 5a-5d, pl.58 figs. 1-2.

Comatella stelligera: A. H. Clark, 1918: 4, pl. 2; 1931: 98, pl. 4 figs. 6-9; Gislēn, 1922: 18, 28, figs. 7-9; Utinomi & Kogo, 1968: 48 (list); A. M. Clark, 1972: 85; Gibbs et al, 1976: 109; Liao, 1983: 263, pl. 1; Chen et al., 1988: 76, fig. 6; Liao & A. M. Clark, 1995: 27, fig. 12, pl. 1 fig. 2; Kogo, 1998: 14, fig. 9; Pilcher & Messing, 2001: 16 (list).

Material examined: Iv 3184 (1 specimen) & Iv 3265 (1), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description (Iv 3184): Arms 26 in number, 52 mm long; cirri XIV, 18-22 segments; all division series 2; first syzygy on arm arising at Br1+2 or Br3+4, or both; first 2 segments of P_1-P_4 strongly carinate dorsally; comb teeth confluent.

Remarks: The specimen Iv 3265 is rather different for having many cirrus segments (25-29) from another specimen Iv 3184 (18-22) and the description ('usually 20-25') by A. H. Clark (1931).

2. *Comatella* sp. aff. *nigra* (Carpenter, 1888) [Fig. 3]

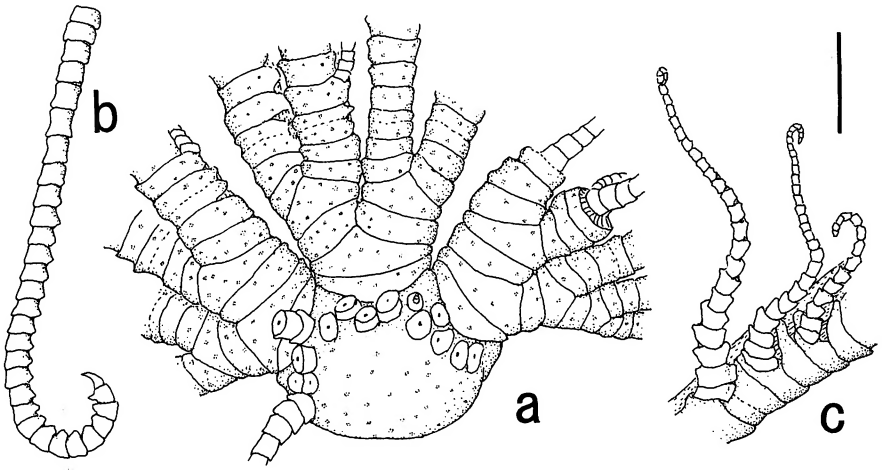

Fig. 3. *Comatella* sp. aff. *nigra* (Carpenter, 1888) (Iv 3128). a, centrodorsal and arm bases; b, a cirrus; c, proximal pinnules. Scale bar: 3 mm.

Actinometra nigra Carpenter, 1888: 304.

Comatella nigra A. H. Clark, 1918: 5, pl. 1; 1931: 92, pl. 1 fig. 1, pl. 2 fig. 2, pl. 3 fig. 3; A. M. Clark, 1975: 392; Gibbs, A. M. Clark, & C. M. Clark, 1976: 110; Meyer & Macurda, 1980: 83; Chen et al., 1988: 76, fig. 5.

Material examined: Iv 3128 (1 specimen), Hirase, north of Kuchinoshima Isl., Satsunan Isls., 30° 05.77'N, 130° 04.54'E, St. 6, 96 m in depth, dredge, I. Kogo coll., 28 May 1999.

Description: Arms 21 in number, 60 mm long; centrodorsal thick discoidal, 5 mm in diameter with broad dorsal pole; radials mostly concealed by centrodorsal except corners; cirri XXV, 26-29, each with a transverse ridge on distal segments; all cirrus segments subequal, nearly as long as broad; all division series 2; ossicles of IBr series smooth dorsally with small lateral expansions, connected by pseudosyzygy; IBr1 about 5 times as broad as long, close to, but not contacted with neighboring ossicles; IIBr series 2 (1+2?); IIIBr series 2 (1+2?); first syzygy on arm arising mostly at Br1+2, and sometimes also at Br3+4; P_1 bearing on Br_2, 33 segments with 5-6 non-confluent teeth; tegmen beset with calcareous concretions.

Remarks: This specimen very close to *Comatella nigra*, judging from having many cirrus segments (26-29) according to the key by A. H. Clark (1931: p. 89). Among five known species of genus *Comatella*, only *C. nigra* has the cirri composed of 26-30 segments more than that of other four species (9-25 segments). Arms of *C. nigra* are 27-80 in number (usually 40-45), 150 to 170 mm long (A. H. Clark, 1931: p. 93). Though, this specimen has only 21 arms (5, 4, 4, 4 and 4 arms on each ray) in spite of not being immature.

3. *Capillaster mariae* (A. H. Clark, 1907)

Japanese name: Futami-umishida

Comatula mariae A. H. Clark, 1907b: 153.

Capillaster mariae : A. H. Clark, 1918: 10, 18; 1931: 170, pl. 12 fig. 32; Utinomi & Kogo, 1968: 48 (list); Kogo, 1998: 16, fig. 11.

Material examined: Iv 3189 (1 specimen) & Iv 3236 (1), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 11-15 (presumably 20 when grown up) in number, ca. 50 mm long; cirri XX-XXI, 13-18 segments; all division series 2; ossicles of division series and proximal brachials with smooth distal margin; first syzygy on arm arising at Br2+3; combs with 5-10 confluent teeth.

4. *Capillaster multiradiatus* (Linnaeus, 1758)

Japanese name: Ryukyu-futami-umishida

Asterias multiradiata Linnaeus, 1758: 663.

Capillaster multiradiata: A. H. Clark, 1918: 10 (key); 1931: 173, pl. 3 fig. 5; Rowe & Gates, 1995:139.

Capillaster multiradiatus: A. M. Clark and Rowe, 1971: 15 (key); A. M. Clark, 1972 : 76; Marshall & Rowe, 1981: 382; Tamura, 1983: 12, pl. 2 fig. 3; Meyer & Macurda, 1980: 75, fig. 6a; Chen et al., 1988: 75, fig. 3; Liao & A. M. Clark, 1995: 14, fig. 4; Kogo, 1998: 17, fig.12.

Material examined: Iv 3185 (8 specimens), Iv 3191 (2), Iv 3198 (1), Iv 3199 (2), Iv 3215 (1), Iv 3216 (1), Iv 3218 (1), Iv 3220 (2), Iv 3223 (1), Iv 3229 (1), Iv 3234 (14), Iv 3235 (10), Iv 3271 (8), Iv 3275 (18), & Iv 3276 (1), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 11-26 in number, 42-95 mm long; cirri XVIII-XXIX, 15-29 (mostly 22-28) segments; IIBr series usually 4(3+4), rarely 2, IIIBr series 3(2+3) when present; first syzygy on arm arising at Br2+3; ossicles of division series and brachials of middle arm rugged distally with spiny margins; combs of P_1 with 10-13 confluent teeth.

5. *Alloeocomatella pectinifera* (A. H. Clark, 1911)

Japanese name: Zenmai-toude-kushi-umishida

Comissia pectinifera A. H. Clark, 1911: 644; 1931: 255, pl. 25.

Comissia magnifica: Kogo, 1998: 20, fig. 15.

Alloeocomatella pectinifera: Messing, 1995: 445-450, figs. 5-6; 2001: 291; Crossland & Price, 1999: 25.

Material examined: Iv 3200 (1 specimen), Iv 3217 (1) & Iv 3232 (2), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 10 in number, 36-70 mm long; cirri XXV-XXXVII, 14-19 segments;

longest cirrus segment 2 times as long as broad; articulation of division series deeply compressed laterally; brachials of middle arm with spiny distal margins; first syzygy on arm arising at Br3+4; comb long with 25-27 confluent teeth; tegmen plated or with calcareous concretions.

Remarks: Two specimens from the Okinawa Island (Iv 2918, 2974) once were identified as *Comissia magnifica* (Kogo, 1998). Messing (2001) corrected for this misidentification. This is the first record in Japanese waters under the new specific name. A related species *A. polycladia* Messing, 1995 was reported by Pilcher & Messing (2001) from the Kerama Islands in the Nansei Islands as the new record in Japan.

6. *Comatula pectinata* (Linnaeus, 1758)

Japanese name: Ashikake-kushi-umishida

Asterias pectinata Linnaeus, 1758: 603.

Comatula pectinata: A. H. Clark, 1918: 271; 1931: 339, figs. 49, 100-107; A. M. Clark, 1972: 85; Gibbs et al, 1976: 109; Chen et al., 1988: 77, fig. 13; Liao & A. M. Clark, 1995: 28, fig. 13; Kogo, 1998: 23, fig. 17; Pilcher & Messing, 2001: 16 (list).

Material examined: Iv 3186 (5 specimens) & Iv 3212 (1), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description (a larger specimen of Iv 3186): Arms 10 in number, about 65 mm long; cirri XI-XIII, 9-13 segments without dorsal spine; longest cirrus segments 1.5-2 times as long as broad; IBr series 1+2; brachials smooth; proximal syzygies of arm arising at Br1+2, usually also at Br3+4; combs confined P_1, P_2, and P_3 with about 10 confluent teeth; 2nd and 3rd segments of P_1, P_2, and P_3 prominently carinate dorsally.

7. *Comatulides* sp. aff. *decameros* (A. H. Clark, 1908)

Comanthus decameros A. H. Clark, 1908a: 221.

Comatulides decameros: A. H. Clark, 1918: 32.

? *Comatulides decameros*: Geislēn, 1922: 31.

Material examined: Iv 3193 (1 specimen), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 10 in number, 33-40 mm long; centrodorsal low hemispherical; cirri XXI, 15 segments with minute dorsal spines, 5.5 mm long, arranged in 2-3 rows; longest cirrus segment about 1.5 times as long as broad; radials and ossicles of division series smooth; first brachial syzygy at Br3+4; P_1 25-27 segments including 8-11 confluent teeth, about 1.5 times as long as P_2; P_3 excessively short, 10 segments without tooth; middle segments of proximal pinnules with distal spines.

8. *Phanogenia multibrachiata* (Carpenter, 1888)

Japanese name: Tawan-hitofushi-umishida

Actinometra multibrachiata Carpenter, 1888b: 299, pl. 56 figs. 5-6.
Comaster multibrachiata: A. H. Clark, 1931: 437; A. M. Clark & Rowe, 1971: 16 (key).
Comaster multibrachiatus: Tamura, 1983: 6, pl. 4 fig. 8, pl. 5 fig. 9; Liao & A. M. Clark, 1995: 25, fig. 11; Kogo, 1998: 26, fig. 20.
Phanogenia multibrachiata: Messing, 1998: 206.

Material examined: Iv 3264 (1 specimen), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Presumably 120 arms, 100 mm long; cirri XVIII, 13 segments, arranged in a single row; longest cirrus segments slightly longer than broad; IIBr series 4(3+4), IIIBr series 2, IVBr series usually 4(3+4) exteriorly and 2 interiorly, VBr and VIBr series 4(3+4) or 2; first syzygy on arm arising at Br1+2, rarely Br2+3; combs extend to P_6 with confluent 4-7 teeth.

9. *Phanogenia brevicirra* (Bell, 1894)

Japanese name: Koashi-hitofushi-umishida

Antedon brevicirra Bell, 1894: 400.
Comaster parvus: A. H. Clark, 1918: 37, 41, 274, 275; Gislēn, 1927: 9, 15, figs. 5-6.
Comaster brevicirra: A. H. Clark, 1931: 444, pl. 29 figs. 84-86; Utinomi & Kogo, 1968: 48 (list); Kogo, 1998: 28, fig. 22.
Phanogenia brevicirra: Messing, 1998: 191-209.

Material examined: Iv 3187 (4 specimens), Iv 3233 (3), & Iv 3280 (1), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 27-37 in number, 30-50 mm long; cirri XVI-XXIII, 10-11 segments, arranged in a single row; longest cirrus segment nearly 2 times as long as broad; IBr series syzygy or cryptosyzygy, IIBr series 4(3+4), IIIBr series usually 2(1+2), rarely 4(3+4); brachials of middle arm everted distally with minute spines at distal margins; first syzygy on arm arising at Br1+2; middle segments of most pinnules with prominent spinous margins; combs with 8-12 confluent teeth.

10. *Phanogenia serrata* (A. H. Clark, 1907)

Japanese name: Toge-hitofushi-umishida

Comatula serrata: A. H. Clark, 1907b: 154.
Comaster serratus: Gislēn, 1927: 2, 9.
Comaster serrata: A. H. Clark, 1918: 37; 1931: 451, pl. 52 fig. 154; Utinomi & Kogo, 1968: 48 (list).
? *Comaster serratus*: Kogo, 1998: 28, fig. 23.
Phanogenia serrata: Messing, 1998: 206.

Material examined: Iv 3129 (1specimen), Hirase, north of Kuchinoshima Isl., Satsunan Isls., 30° 05.77'N, 130° 04.54'E, St. 6, 96 m in depth, dredge, I. Kogo coll., 28 May 1999; Iv 3132 (1), Ohshima-Shinsone, Satsunan Isls., 28° 52.52'N, 129° 33.13'E, St. 7, 158 m in depth, dedge, I. Kogo coll., 29 May 1999; Iv 3133 (1), South of Iejima Isl., Ryukyu Isls., 26° 39.00'N, 127° 42.00'E, St. 9, 95 m in depth, dredge, I. Kogo coll., 30 May 1999; Iv 3168 (1), North of Tokashikijima Isl., Ryukyu Isls., 26° 15.80'N, 127° 21.90'E, St. 11, 95-115 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999; Iv 3290 (1), East of Ukejima Isl., Satsunan Isls., 27° 59.40'N, 129° 27.80'E, St. 13, 128 m in depth, dredge, I. Kogo coll., 1 June 1999.

Description: Arms 15-24 (mostly 22-24) in number, 26-36 mm long; cirri X-XVIII, 8-9 segments, arranged in a single row; longest cirrus segment 2-3 times as long as broad; IBr series 1+2, IIBr series 4(3+4), IIIBr and IVBr series 2(1+2) when present; first syzygy on arm arising at Br1+2; brachials and pinnule segments with finely spiny distal ends; combs with about 5-8 confluent teeth.

11. *Comaster nobilis* (Carpenter, 1888)

Japanese name: Hana-umishida

Actinometra nobilis Carpenter, 1888b: 336, pl. 65.

Comanthus schlegelii: H. L. Clark, 1921: 21.

Comanthina schlegelii: A. H. Clark, 1931: 466, pl. 54 fig. 159, pl. 55 figs. 160-161.

Comanthina schlegeli: Utinomi & Kogo, 1965: 265, figs. 2-3, pl. 12 fig. 1; 1968: 48 (list); Liao & A. M. Clark, 1995: 18, fig. 8.

Comanthina nobilis: Rowe et al., 1986: 243, fig. 8B; Kogo, 1998: 31, fig. 25.

Comaster nobilis: Messing, 1998: 206; Pilcher & Messing, 2001: 16 (list).

Material examined: Iv 3283 (1 specimen), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 93+ (presumably 100) in number, 75 mm long; centrodorsal reduced to level of radials without cirrus; IIBr series 4(3+4), IIIBr series generally 4(3+4) interiorly and 2 exteriorly, IVBr and VBr series 4(3+4); combs with paired teeth, extending to P5-P6.

12. *Comanthus alternans* (Carpenter, 1881)

Japanese name: Nejire-umishida

Actinometra alternans Carpenter, 1881: 208.

Comantheria alternans: A. H. Clark, 1931: 488; Clark & Rowe, 1971: 16 (key).

Comanthus alternans: Rowe et al., 1986: 224, fig. 6A; Kogo, 1998: 33, fig. 26.

Material examined: Iv 3146 (1 specimen), North of Tokashikijima Isl., Ryukyu Isls., 26° 15.80'N, 127° 21.90'E, St. 11, 95-115 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999; Iv 3188 (1), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 50-60 in number, 110 mm long; centrodorsal reduced to level of radials without cirrus; IIBr series 4(3+4), IIIBr series generally 2, IVBr series usually 4(3+4) exteriorly and 2 interiorly; outer ossicles of IIIBr series twisted; first syzygy on arm arising at Br3+4; combs partly with paired teeth, extending to P6.

13. *Comanthus parvicirrus* (Müller, 1841)

Japanese name: Koashi-umishida

Alecto parvicirra Müller, 1841: 185. (not referred directly)

Comanthus parvicirra: A. H. Clark, 1918: 5; 1931: 631, figs. 88, 184, 200, 209, 210, 211-218, 221.

Comanthus (Vania) parvicirra: A. H. Clark, 1918: 54; Gislēn, 1922: 50, 70, figs. 41-45.

Comanthus tipica: Gislēn, 1922: 50, 54.

Comanthus (Vania) parvicirra comasteripinna: Gislēn, 1922: 4.

Comanthus parvicirra alpha comasteripinna: Gislēn, 1922: 50, figs. 41-44.

Comanthus (Comanthus) parvicirra: Utinomi & Kogo, 1965: 263, 270, fig. 6, pl. 12 fig. 3; 1968: 49 (list), fig. 1; Honma and Kitami, 1978: 46 (list).

Comanthus (Comanthus) parvicirrus: Tamura, 1983: 19, pl. 9 figs. 17-18.

Comanthus parvicirrus: A. M. Clark & Rowe, 1971: 6-7 (table), 12 (key); A. M. Clark, 1972: 77; Gibbs et al, 1976: 109; Marshall & Rowe, 1981: 383; Liao, 1983: 264; Rowe et al., 1986: 211, fig. 5; Meyer & Macurda, 1980: 80, figs. 4f-4g; Chen et al., 1988: 76, fig. 10; Liao & A. M. Clark, 1995: 21, fig. 10, pl. 2 fig. 1; Kogo, 1998: 33, fig. 27; Pilcher & Messing, 2001: 16 (list).

Material examined: Iv 3190 (3 specimens), Iv 3194 (2), Iv 3227 (1), Iv 3228 (8), Iv 3231 (2 juviniles), & Iv 3281 (2 juv.), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999; Iv 3135 (1), South coast of Agunijima Isl., Ryukyu Isls., ca. 5 m in depth, diving, S. Kubota coll., 30 May 1999.

Description: Arms 13-37 in number, 55-105 mm long; centrodorsal reduced to a thin discoid; cirri VII-XVIII, 11-16 segments; division series usually 4(3+4), partly 2; first syzygy on arm arising at Br3+4; combs extended to Pm with confluent teeth; middle segments of Pd without spine at distal margin.

14. *Comanthus gisleni* Rowe et al, 1986

Japanese name: Gisuren-umishida

Comanthus gisleni Rowe et al, 1986: 219, figs. 4B, 5D; Kogo, 1998: 35, fig. 28.

Material examined: Iv 3226 (1specimen) & Iv 3269 (1), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description (Iv 3269): Arms 19 in number, 70 mm long; cirri small, XI, 11 segments, with transverse ridges on distal segments; IBr1 excessively short, tightly contact with each other, IBr2

(axillary) triangular; IIBr series 4(3+4); first syzygy on arm arising at Br3+4; Pm with a comb or spines; middle segments of Pd with spines at distal margins.

Remarks: The specimen Iv 3226 is regarded as a immature of this species with only 10 arms of 120 mm long; centrodorsal reduced to level of radials, 1.5 mm across, with a flat dorsal area; cirri small, stout, arranged in a row, XV, 12-14, 5-6 mm long, each with a minute transverse ridge on distal segments; longest cirrus segments about 2.2 times as long as broad; radials oblong; IBr1 3 times as broad as long, tightly connected with neighboring ossicles; first brachial syzygy at Br3+4; P1 31 segments with 8 teeth; combs extended to P4 with 8-9 paired teeth composed of a large left tooth and a small right tooth.

15. *Oxycomanthus comanthipinna* (Gislēn, 1922)

Japanese name: Kohige-kushi-umishida

Comanthus (Vania) parvicirra beta comanthipinna Gislēn, 1922: 51, figs. 44, 45.
Oxycomanthus comanthipinna: Rowe et al. 1986: 249, figs. 3A, 8G-8H; Kogo, 1998; 48, fig. 37.

Material examined: Iv 3136 (1 specimen), South coast of Agunijima Isl., Ryukyu Islns., ca. 5 m in depth, diving, S. Kubota coll., 30 May 1999.

Description: Arms 16 in number, slender, 37 mm long; cirri small, XIII, 12 segments, 7 mm long; distal cirrus segments each with a transverse ridge at distal edge; each IBr1 (also each Br1) separated laterally in distal portion; IIBr series mostly 4(3+4), partly 2; brachials of middle arm somewhat everted distally, as long as or slightly longer than broad with prominent spines at distal margins; first syzygy on arm arising at Br3+4; combs occurring as far as P2 with prominent blade-like teeth; P3 with about 6 teeth occasionally; a longitudinal line of dark red present on dorsal side of arms under preserved condition.

16. *Oxycomanthus exilis* Rowe et al., 1986

New Japanese name: Hige-kushi-umishida

Oxycomanthus exilis Rowe et al., 1986: 251, fig. 9A.
? *Oxycomanthus exilis*: Kogo, 1998: 49, fig. 38.

Material examined: Iv 3192 (1 specimen), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 15+ (presumably 20) in number, stout, 21+ mm long; cirri small, XIV, 11-12 segments, 5 mm long; each IBr1 (also each Br1) perfectly fused laterally, IIBr series mostly 4(3+4), partly 2; first syzygy arising at Br3+4; brachials of middle arm shorter than long, everted distally, with minute spines at distal margins; first syzygy on arm arising at Br3+4; P1 22-26 segments with 5 non-confluent teeth; combs confined to P1; P2 10-13 segments without tooth, P3 12 segments with gonad.

Remarks: Kogo (1998: 48, fig. 38) reported '? *Oxycomanthus exilis*' based on 2 specimens from the coastal sea of Wakayama Prefecture, central Japan. In those specimens P2 bears a comb

with 5 teeth. But Rowe et al. (1986) described 'combs do not occur beyond P_1, except on arms arising directly from IBr axillary' in its diagnosis. From this point of view, those specimens from Wakayama are belonging to *O. comanthipinna* or a certain species in the genus *Clarkcomanthus*. Therefore, this may be regarded as the first record of *O. exilis* from Japanese waters.

?Comissia sp. A

Material examined: Iv 3131 (2 juvenile specimens), Ohshima-Shinsone, north of Amami-Ohshima Isl., Satsunan Isls., 28° 52.52'N, 129° 33.13'E, St. 7, 158 m in depth, dredge, I. Kogo coll., 29 May 1999.

Description (larger specimen): Arms 10 in number, 30 mm long; centrodorsal discoidal; cirri XVII, 10, 4 mm long with dorsal spines on distal segments; longest cirrus segments 3 times as long as broad; radials very short; IBr series 1+2?; IBr_1 4 times as broad as long; ossicles of division series with fin-like expansions on both sides; syzygies on arms at Br1+2? and 3+4; brachials and pinnule segments with spines at distal ends; P_1 22 segments with 10 teeth, P_2 15-21 with 11 teeth, P_3 and P_4 14-15 with or without comb, P_4 10 without comb, Pa present; some combs with 2 or 3 paired teeth.

?Comissia sp. B

Material examined: Iv 3148 (1 juvenile specimen), North of Tokashikijima Isl., Ryukyu Isls., 26° 15.80'N, 127° 21.90'E, St. 11, 95-115 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 10 in number, 9 mm long; centrodorsal low hemispherical, 0.7 mm across; radials belt-like; cirri XVI, 7-8, 2 mm long without spine, arranged in 1-2 rows; longest cirrus segments 3 times as long as broad; radials very short; IBr series 2(1-2); IBr_1 2 times as broad as long; first brachial syzygy at Br3+4; P1 21 segments with 7-8 teeth, 2 times as long as P_2. P_2 with 6 teeth, P_3 14 segmenets with 5 teeth, longer than P_2, P_4 7 segments without tooth; combs confluent.

?Comissia sp. C

Material examined: Iv 3201 (1 juvenile specimen), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999; Iv 3291 (1 juv.), East of Ukejima Isl., Satsunan Isls., 27° 59.40'N, 129° 27.80'E, St. 13, 128 m in depth, dredge, I. Kogo coll., 1 June 1999.

Description (Iv 3291): Arms 10 in number, broken (presumably 20-25 mm long); centrodorsal thin discoidal, 2.4 mm in diameter; cirri XX, 12, 4 mm long with minute dorsal spines, arranged in a single, partly 2 rows; longest cirrus segments 2-3 times as long as broad; radials concealed except corners; arms broken, presumably 20-25 mm long; P_1 21-23 segments with 6 confluent teeth, about 2 times as long as P_2; combs not extend to P_4.

Remarks: Iv 3201 is smaller individual than Iv 3291, with a centrodorsal of only 1.2 mm in diameter.

Family Zygometridae

17. *Zygometra comata* A. H. Clark, 1911

Japanese name: Togeashi-kase-umishida

Zygometra comata A. H. Clark, 1911a: 537; 1918: 59 (key); 1941: 110, pl. 4 figs. 13-14, pl. 5 figs. 15-17; A. M. Clark, 1972: 93, fig. 6; Liao & A. M. Clark, 1995: 32, fig. 15; Kogo, 1998: 53, fig. 41.

Material examined: Iv 3139 (2 specimens), Iv 3163 (1 juvenile), & Iv 3165 (1 juv.), North of Tokashikijima Isl., Ryukyu Isls., 26° 15.80'N, 127° 21.90'E, St. 11, 95-115 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999; Iv 3170 (1), Iv 3240 (2), Iv 3242 (1), Iv 3243 (1), Iv 3246 (1), Iv 3249 (2), Iv 3250 (1), Iv 3261 (1 juv.), Iv 3266 (3), & Iv 3277 (1), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms variable in both number and length, 10-24 (usually 13-20) in number, 22-95 mm long; cirri fragile, XII-XXXIII (usually XIII-XX), 21-35 segments each with a sharp dorsal spine; IBr series 1+2, IIBr series usually 4(3+4), occasionally 2, IIIBr series, when present, 2; ossicles of division series with thick ventrolateral expansions; proximal segments of P_1 without dorsal carination.

Remarks: A. H. Clark (1941) described that the arms are 14-41 (average about 25) in number and are 40 to 135 (average about 85) mm long. Most of the specimens from St. 11 and St. 12 seem to be rather young individuals judging from their arm lengths.

18. *Catoptometra magnifica* A. H. Clark, 1908

Japanese name: Ohkobu-umishida

Catoptometra magnifica A. H. Clark, 1908b: 208; 1918: 63 (key), 64; 1941: 126, pl. 7 figs. 24-25, pl. 8 fig. 26, pl. 9 fig. 31; Gislén, 1922: 17; Utinomi & Kogo, 1965: 273; 1968: 49 (list); Liao & A. M. Clark, 1995: 30, fig. 14; Kogo, 1998: 53, fig. 43.

Material examined: Iv 3209 (1 specimen), Iv 3225 (2 juveniles), Iv 3260 (2), Iv 3268 (1), & Iv 3286 (1 juv.), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 10-45 (mostly 35-45) in number, 75-95 mm long; centrodorsal large, thick discoidal with a deep dorsal depression; cirri XXIII-XLV (mostly XXXV-XL), 13-23 (usually 20-23) segments without spine; all division series 2; IBr series 1+2; P_2 37-43 segments, longer than P_1; proximal 2-3 segments of P_1 highly carinated dorsally.

Remarks: Iv 3225 & Iv 3286 are quite young individuals. The former has 13 arms (2 each on

four rays, 5 on one ray), up to 30 mm long; centrodorsal 3.0 mm in diameter; cirri composed of 14-19 segments, ca. 9 mm long. The latter only 10 arms, 24 mm long; centrodorsal 2.4 mm in diameter; cirri with 13-14 segments, 8.0 mm long. In these specimens, proximal 2-3 segments of P_1 provide each with a small carination or spines dorsally, instead of high carination in other larger specimens.

Family Eudiocrinidae

19. *Eudiocrinus loveni* Gislēn, 1922 [Fig. 4]

Japanese name: Kohire-madara-umishida

Eudiocrinus loveni Gislēn, 1922: 72, figs. 53-56, photo 6; A. H. Clark, 1941: 156.

Material examined: Iv 3294 (2 specimens), East of Ukejima Isl., (Amami Isls.), Satsunan Isls., 27° 59.40'N, 129° 27.80'E, St. 13, 128 m in depth, dredge, I. Kogo coll., 1 June 1999.

Description (larger specimen): Only 5 arms, 38 mm long; cirri arranged in a single, partly 2 rows, XIX, 16-18 segments, each with a longitudinal crest on distal ones; longest cirrus segments almost as long as broad; ossicles of division series and lower brachials smooth, never highly everted dorsally; Pc (1st pinnule on left side in dorsal view) composed of 7 segments, lower segments with dorsal processes, not prominent spatulate, much broader than long; 3rd and 4th segments of Pa (next pinnule after Pc) 1.5 times as long as broad.

Remarks: This species is extremely rare in Japanese waters. This is the second report since Gislēn (1922) described this species based on a single specimen collected from the Ogasawara Islands in 1914.

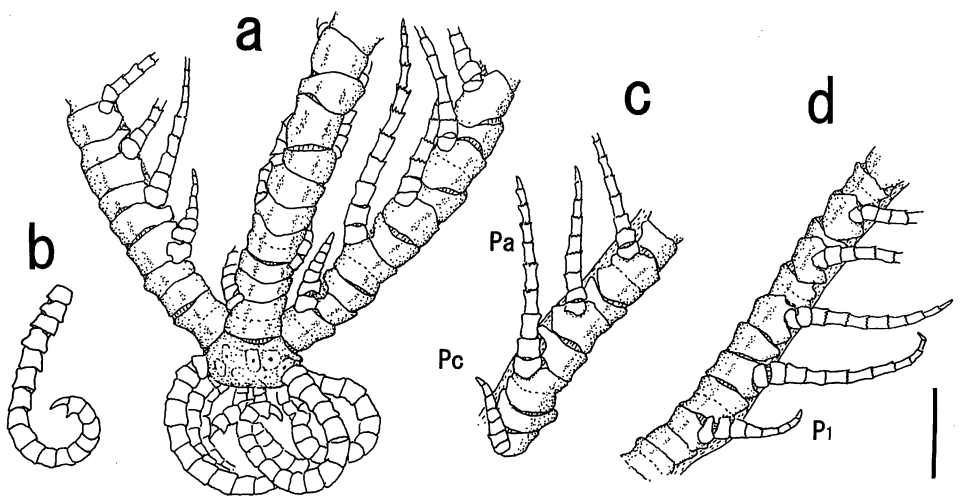

Fig. 4. *Eudiocrinus loveni* Gislēn, 1922 (Iv 3294). a, centrodorsal and arm bases; b, a cirrus; c, proximal pinnules (left side of arm); d, proximal pinnules (right side). Scale bar: 2 mm.

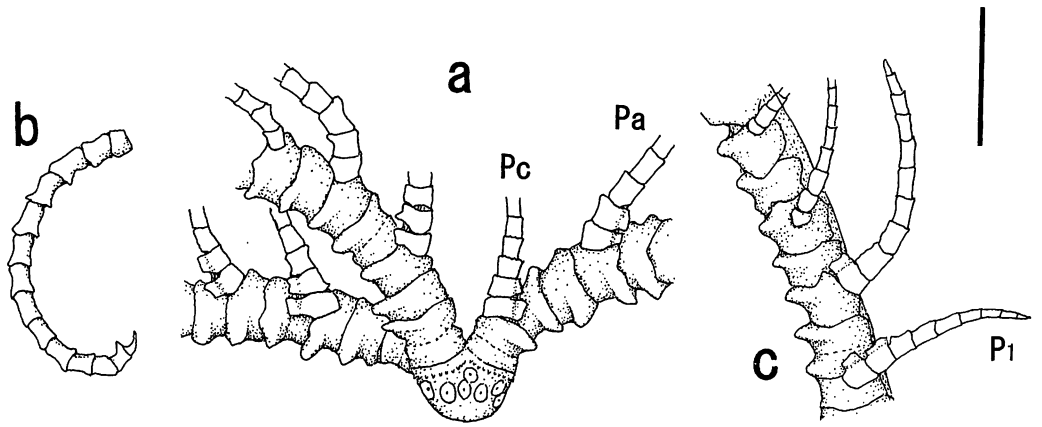

Fig. 5. *Eudiocrinus venustulus* A. H. Clark, 1912 (Iv 3137). a, centrodorsal and arm bases; b, a cirrus; c, proximal pinnules (right side of arm). Scale bar: 2 mm.

20. *Eudiocrinus venustulus* A. H. Clark, 1912 [Fig. 5]

New Japanese name: Hire-madara-umishida

Eudiocrinus venustulus A. H. Clark, 1912e: 27; 1941: 160; Gislēn C1922: 7, 73; Liao & A. M. Clark, 1995: 5 (list), 35.

Material examined: Iv 3137 (44 specimens), Iv 3140 (1), & Iv 3162 (1 juvenile), North of Tokashikijima Isl., Ryukyu Isls., 26° 15.80'N, 127° 21.90'E, St. 11, 95-115 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999; Iv 3274 (1), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description (Iv 3137, larger specimens): Only 5 arms, 42-51 mm long; cirri arranged in 2 partly 3 rows, XX-XXIV, 13-19 (mostly 15-18) segments without dorsal spine; longest cirrus segment nearly 2 times as long as broad, middle segments flared distally; ossicles of division series and lower brachials with excessively everted dorsal edges; Pc with 7-11 segments, basal ones excessively broader than long, each with a large spatular process; 3rd segment of Pa as long as broad.

Remarks: This is the first record in Japanese waters, has been so far known from Philippines and the South China Sea (A. H. Clark, 1941; Liao & Clark, 1995).

21. *Eudiocrinus indivisus* (Semper, 1868) [Fig. 6]

New Japanese name: Futomadara-umishida

Ophiocrinus indivisus Semper, 1868: 68.

Eudiocrinus indivisus : Gislēn, 1922: 4, 6, 68, 183, fig. 52; A. H. Clark, 1941: 163; Liao & A. M. Clark, 1995: 5 (list), 36.

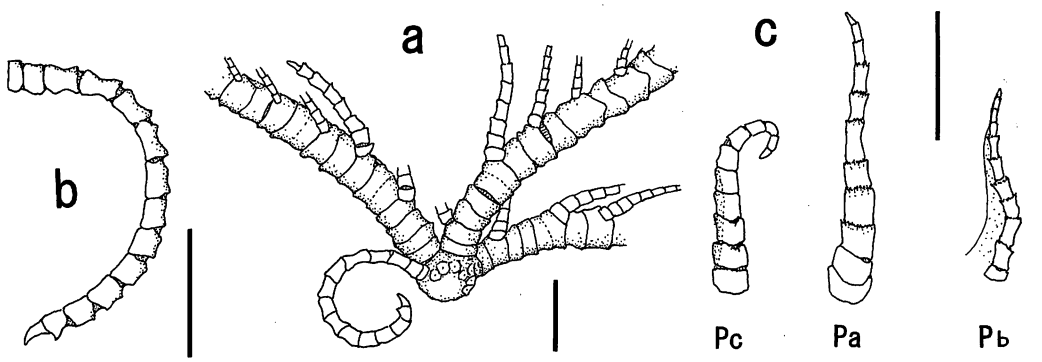

Fig. 6. *Eudiocrinus indivisus* (Semper, 1868) (Iv 3138). a, centrodorsal and arm bases; b, a cirrus; c, proximal pinnules. Scale bar: 2 mm.

Material examined: Iv 3138 (10 specimens), North of Tokashikijima Isl., Ryukyu Isls., 26° 15.80'N, 127° 21.90'E, St. 11, 95-115 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999; Iv 3176 (3), Iv 3221 (1), & Iv 3222 (3), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Only 5 arms, 20-58 mm long; cirri smooth, arranged in 1-2 rows, XII-XXI, 13-17 segments without dorsal spine; longest cirrus segment about 1.5 times as long as broad; ossicles of division series and lower brachials evidently smooth dorsally; Pc with 10-12 segments of slightly broader than long, basal ones without spatular process, but slightly carinated dorsally; 3rd segment of Pa as long as broad.

Remarks: This species is extremely rare in Japanese waters, has been so far known only from the Ogasawara Islands (Gislēn, 1922).

Family Himerometridae

22. *Himerometra bartschi* A. H. Clark, 1908

Japanese name: Hosobane-jabara-umishida

Himerometra bartschi A. H. Clark, 1908b: 212; 1941: 209, pls. 14, 16; Clark & Rowe, 1971: 8-9 (table), 21 (key); Messing, 1998: 189 (table); Kogo & Fujita, 2000: 3, figs. 2, 5A.

Material examined: Iv 3181 (1 juvenile specimen), Iv 3195 (2 juv.), Iv 3196 (1), Iv 3202 (8 juv.), Iv 3210 (1 juv.), Iv 3237 (7 juv.), Iv 3267 (1), Iv 3270 (1), Iv 3288 (14), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999; Iv 3289 (1), East of Ukejima Isl., Satsunan Isls., 27° 59.40'N, 129° 27.80'E, St. 13, 128 m in depth, dredge, I. Kogo coll., 1 June 1999.

Description: Arms 12-36 in number, 46-90 mm long; centrodorsal thick discoidal; cirri stout and long, XV-XXXVII (usually XXIII-XXX), 24-44 (26-40) segments; distal cirrus segments each

with a large spine; IIBr series 4(3+4), IIIBr series 2 mostly arising from inner side of ray, IVBr series 4(3+4) when present; ossicles of division series with thick ventrolateral expansions; brachials of middle arm very short; P_1 slender, 17-34 segments, similar, but slightly longer than P_2.

Heterometra schlegelii (A. H. Clark, 1908)

Japanese name: Juzuberi-umishida

Himerometra schlegelii A. H. Clark, 1908a: 223.

Heterometra schlegelii: A. H. Clark, 1941: 329, pl. 39 figs. 180-181.

Material examined: Iv 3171 (1 specimen), Iv 3211 (1), Iv 3239 (1 juvenile), Iv 3258 (1 juv.), & Iv 3272 (4), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 10-19 in number, 46-85 mm long; centrodorsal thick discoidal; cirri stout, XVI-XXII, 21-32 short segments; middle and distal cirrus segments each with a prominent dorsal spine; IIBr series 4(3+4) when present; ossicles of division series usually with ventrolateral expansions; brachials of middle arm excessively short with parallel articulations; P_2 20-24 segments, longer than P_1; basal segments of P_2 broader than long, carinate dorsally.

Remarks: Among the five specimens, Iv 3211 has 19 (4 in 4 rays, and 3 in a ray) arms of 85 mm long, & Iv 3272 has 12 arms of 80 mm long. While the rest 3 specimens (Ivs 3171, 3239, and 3258) have each 10 arms only of 46-55 mm long. These 10 armed specimens are considered as quite young forms with arms branching not arose.

Amphimetra laevipinna (Carpenter, 1882)

Japanese name: Chijimi-hane-umishida

Antedon laevipinna Carpenter, 1882: 502.

Amphimetra laevipinna: A. H. Clark, 1941: 389, pl. 38 figs. 175-176; A. M. Clark & Rowe, 1971: 23 (key); Liao & A. M. Clark, 1995: 37. figs. 18-19, pl. 2 fig. 3; Kogo, 1998: 60, fig. 48.

Material examined: Iv 3244 (1 specimen), North of Tokashikijima Isl., Ryukyu Isls., 26° 15.80'N, 127° 21.90'E, St. 11, 95-115 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999; Iv 3241 (1), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 10 in number, 35-45 mm long; centrodorsal low hemispherical; cirri XVIII, 17-23 segments; longest cirrus segments slightly longer than broad, distal ones with prominent dorsal spines; ossicles of division series with irregular lateral expansions; brachials of middle arm not exceedingly short with oblique or triangular articulations; P_2 13-18 segments, longer than P_1; basal segments of P_2 smooth without carination.

Family Mariametridae

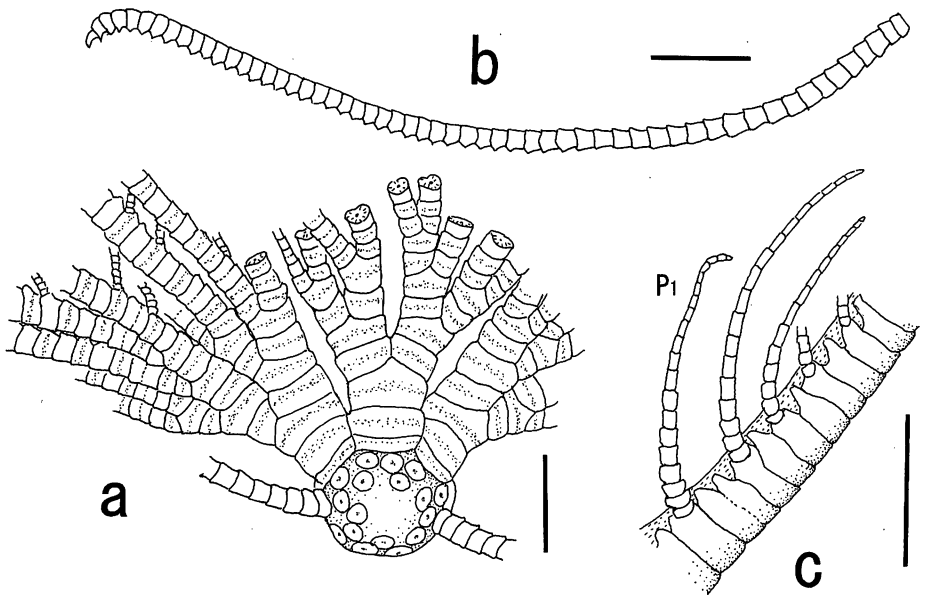

Fig. 7. *Oxymetra finschii* (Hartlaub, 1891) (Iv 3208). a, centrodorsal and arm bases; b, a cirrus; c, proximal pinnules. Scale bar: 5 mm.

25. ***Oxymetra finschii* (Hartlaub, 1891)** [Fig. 7]

New Japanese name: Azami-umishida

Antedon finschii Hartlaub, 1891: 37, 47, 113, fig. 168, pl. 3 fig. 32.

Oxymetra finschii: A. H. Clark, 1941: 402, pl. 37 fig. 168, pl. 44 figs. 197-198, pl. 45 figs. 203-204; A. M. Clark & Rowe, 1971: 8-9 (table), 23 (key).

Material examined: Iv 3208 (1 specimen), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Presumably 45 arms, 72 mm long; centrodorsal hemispherical; cirri arranged in 3 rows, excessively large, XXXVIII, 56 segments, 41 mm long; longest cirrus segments as long as broad; all division series 2; P_1 longest pinnule, not stiffened, 20-26 segments, 12.0 mm long; ossicles of division series and basal brachials each with a transverse stripe (cf. Fig. 7a) of dark red in color; comparative pinnule lengths: $P_1>P_2>P_3>P_4>P_5=P_6<Pm<Pd$.

Remarks: This is the first record in Japanese waters, has been so far known from the Philippines and its neighboring seas (A. H. Clark, 1941).

26. ***Stephanometra spicata* (Carpenter, 1881)**

Japanese name: Ryukyu-toge-umishida

Antedon spicata Carpenter, 1881: 190.

Stephanometra spicata: A. H. Clark, 1918: 103; 1941: 424, pl. 49 figs. 223-224; A. M. Clark and Rowe, 1971: 24 (key); A. M. Clark, 1972: 108; Meyer & Macurda, 1980: 63 (table); Chen et al., 1988: 78, fig. 20; Kogo, 1998: 62, fig. 49.

Material examined: Iv 3255 (1 specimen), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 14 in number, 30 mm long; centrodoral low hemispherical, with a round dorsal pole papillose; cirri XV, 21-26 segments with longitudinal dorsal ridges, no spine; distal edges of radials and lateral edges of IBr_1 with tubercles; axillaries triangular; P_2 and P_3 stiff, elongated, 13-15 segments.

Remarks: This specimen is a rather smaller individual than the others (Iv 1372, 1416, 2675, and 2944) formerly collected at the shore of Okinawa Island which have about 30 arms, 80-160 mm long (Kogo, 1998, p. 62).

27. *Liparometra articulata* (Müller, 1847)

New Japanese name: Ryukyu-tsuya-umishida

Comatula (Alecto) articulata Müller, 1847: 263. (not referred directly)

Liparometra articulata: A. H. Clark, 1941: 461, pl. 53 figs. 240-242; A. M. Clark & Rowe, 1971: 8-9 (table), 24 (key).

? *Liparometra articulata*: Kogo, 1998: 64, fig. 52.

Material examined: Iv 3182 (1 specimen, juvenile), Iv 3197 (1 juv.), Iv 3248 (4 juv.), Iv 3253 (1 juv.), Iv 3259 (18), Iv 3279 (1 juv.), & Iv 3287 (5), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 10-28 in number, 32-85 mm long; cirri arranged in 2 rows, comparatively long, XV-XXXII, 17-31 segments, distal ones with a hooked dorsal spine; longest cirrus segment slightly longer than broad; all division series 2; P_2 and P_3 similar, longest pinnules, 16-23 segments; P_4 nearly half as long as P_2 and P_3.

28. *Liparometra grandis* (A. H. Clark, 1908)

Japanese name: Tsuya-umishdia.

Himerometra grandis A. H. Clark, 1908b: 222.

Liparometra grandis: Gislén, 1922: 74, 182, figs. 85-86; 1927: 22; A. H. Clark, 1941: 467, pl. 52 figs. 238-239; Utinomi & Kogo, 1965: 273; Kogo, 1998: 63, fig. 51.

Material examined: Iv 3141 (2 specimens), North of Tokashikijima Isl., Ryukyu Isls., 26° 15.80'N, 127° 21.90'E, St. 11, 95-115 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description (larger specimen): Arms 42 in number, 62 mm long; centrodorsal thick with a large dorsal depression; cirri very long, XXX, up to 40 segments with prominent dorsal spines;

longest cirrus segments as long as broad; all division series 2; brachials prominently compressed laterally; basal pinnules elongated; both P_2 and P_3, sometimes also P_4, similar, longest pinnules, 19-23 segments.

29. *Lamprometra palmata* (Müller, 1841)

Japanese name: Higasa-umishida

Alecto palmata Müller, 1841: 185.

Lamprometra palmate palmata: A. H. Clark, 1941: 474, pls. 53-55 figs. 243-257; Utinomi & Kogo, 1965: 274, pl. 12 fig. 7, text-fig. 4; A. M. Clark, 1972: 104, figs. 10a-e; Honma and Kitami, 1978: 46 (list); Tamura, 1983: 21, pl. 11 figs. 21-22; Liao & A. M. Clark, 1995: 41, fig. 21; Kogo, 1998: 65, fig. 53.

Lamprometra palmata: A. M. Clark & Rowe, 1971: 24 (key); Meyer & Macurda, 1980: 84, fig. 7a; Chen et al., 1988: 78, fig. 21; Pilcher & Messing, 2001: 16 (list).

Material examined: Iv 3172 (1 specimen), Iv 3173 (1 juvenile), Iv 3174 (3 juv.), Iv 3177 (20), Iv 3214 (1), Iv 3219 (1), Iv 3224 (1), Iv 3245 (2 juv.), Iv 3251 (4), Iv 3252 (1), & Iv 3273 (1), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 10-14 in number, 20-40 (mostly 30-40) mm long; cirri arranged in 1-3 (mostly 2) rows, XIII-XXX, 18-25 segments, distal ones with small dorsal spines; longest cirrus segments slightly longer than broad; radials visible as a slit, not concealed by centrodorsal; all division series 2; P_2 12-18 segments, 3.8-6.5 mm long, markedly longer than other proximal pinnules.

Remarks: All the specimens are rather small and young. Supposedly for this reason, they differ from the adults in radials mostly concealed by centrodorsal, and arms arising 30-40 in number (A. H. Clark, 1941).

30. *Dichrometra doederleini* (de Loriol, 1900)

Japanese name: Subesube-umishida

Antedon doderleini de Loriol, 1900: 93.

Dichrometra doederleini: A. H. Clark, 1941: 562, pl. 58 fig. 271, pl. 59 fig. 272-273; Utinomi & Kogo, 1968: 49 (list); Liao & A. M. Clark, 1995: 39, fig. 20; Kogo, 1998: 68, fig. 55.

Material examined: Iv 3230 (1 specimen), Iv 3254 (1), & Iv 3257 (1), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 26-29 in number, 70-95 mm long; cirri XXI-XXXI, 28-39 segments, distal ones with a prominent dorsal spine; longest cirrus segment as long as broad; radials perfectly concealed by centrodorsal; all division series 2 with thick ventrolateral expansions; proximal pinnules elongated with middle segments slightly longer than broad; P_3 17-27 segments, longest pinnule.

31. ***Mariametra vicaria* (Bell, 1894)** [Fig. 8]

New Japanese name: Bikaria-toge-umishida

Antedon vicaria Bell, 1894: 400.

Mariametra vicaria: A. H. Clark, 1941: 573; Liao & A. M. Clark, 1995: 42, fig. 22.

Material examined: Iv 3145 (2 specimens) & Iv 3161 (2), North of Tokashikijima Isl., Ryukyu Isls., 26° 15.80'N, 127° 21.90'E, St. 11, 95-115 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 22-27 in number, 37-40 mm long, with a narrow median dark reddish stripe longitudinally (cf. Fig. 8a); cirri XX-XXIV, 27-31 segments, 13-15 mm long; longest cirrus segments 1.5 times as long as broad; each middle and distal cirrus segments, with a sharp dorsal spine; all division series 2; ossicles of division series and arm bases covered with closely crowded small spines; P_3 longest pinnule, composed of 14-15 cylindrical segments, 4.0-5.5 mm long; Pa present; comparative pinnule lengths: $P_1<P_2<P_3>P_4>P_5=P_6<Pm<Pd$.

Remarks: This is the first record in Japanese waters, hitherto known from south of Hainan Island, China, southward to the Kei Islands, Indonesia (A. H. Clark, 1941; Liao & A. M. Clark, 1995).

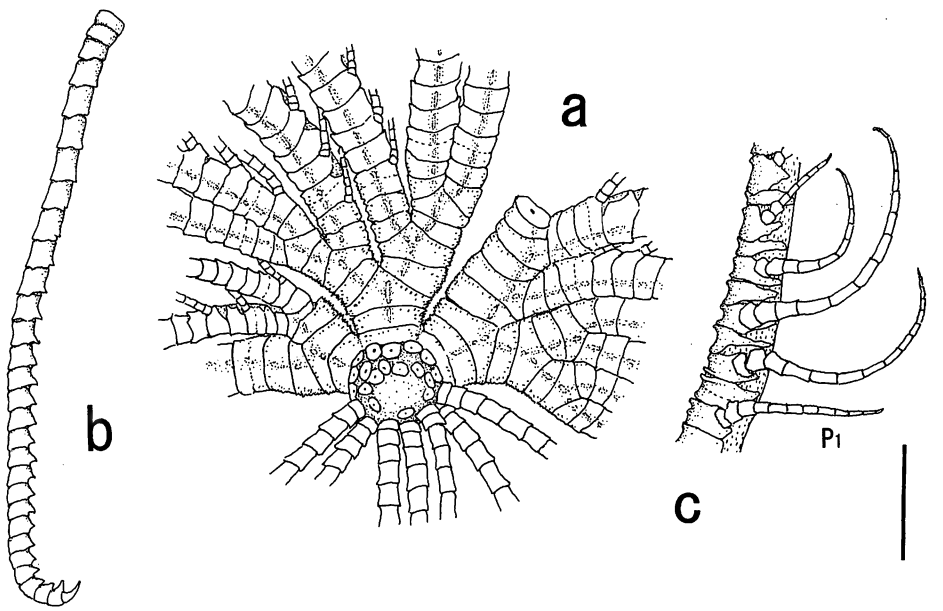

Fig. 8. *Mariametra vicaria* (Bell, 1894) (Iv 3145). a, centrodorsal and arm bases; b, a cirrus; c, proximal pinnules. Scale bar: 3 mm.

Family Colobometridae

32. *Basilometra boschmai* A. H. Clark, 1936 [Fig. 9]

Japanese name: Kotengu-umishida

Basilometra boschmai A. H. Clark, 1936: 305, pl. 7 figs. 1-4; 1947: 22, pl. 5 figs. 16-19; Chen et al., 1988: 77, fig. 15; Kogo, 1998: 72, fig. 58; Pilcher & Messing, 2001: 16 (list).

Material examined: Iv 3166 (1 specimen), North of Tokashikijima Isl., Ryukyu Isls., 26° 15.80'N, 127° 21.90'E, St. 11, 95-115 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 18+ (2, 2, 2, 5+, and 7 on each ray) in number; IIBr series 4(3+4) and IIIBr 2; P_1 much weaker and smaller than P_2 (cf. Fig. 9c), and usually P_3 and P_4 lacking in case of arms arising from IBr series: on the contrary, in case of arms arising from IIIBr series, P_1 long, rather stiff and similar to P_2 and P_3 (cf. Fig. 9d).

Remarks: This specimen seems as a very young individual. So that it much differs from other specimens collected formerly (Iv 2677, 2678) from Kerama Islands. This specimen has only 18+ arms and no conspicuous synarthrial tubercles on ossicles of division series. On the other hand, the other specimens have about 70-80 arms, with conspicuous synarthrial tubercles (Kogo, 1998: p. 72). The most characteristic feature in this specimen is the difference of pinnulations between on the arms of IBr series and that of IIIBr series. This curious pinnulation in this specimen, particularly on the arms of IBr series, is considered to be a reflection of its immaturity.

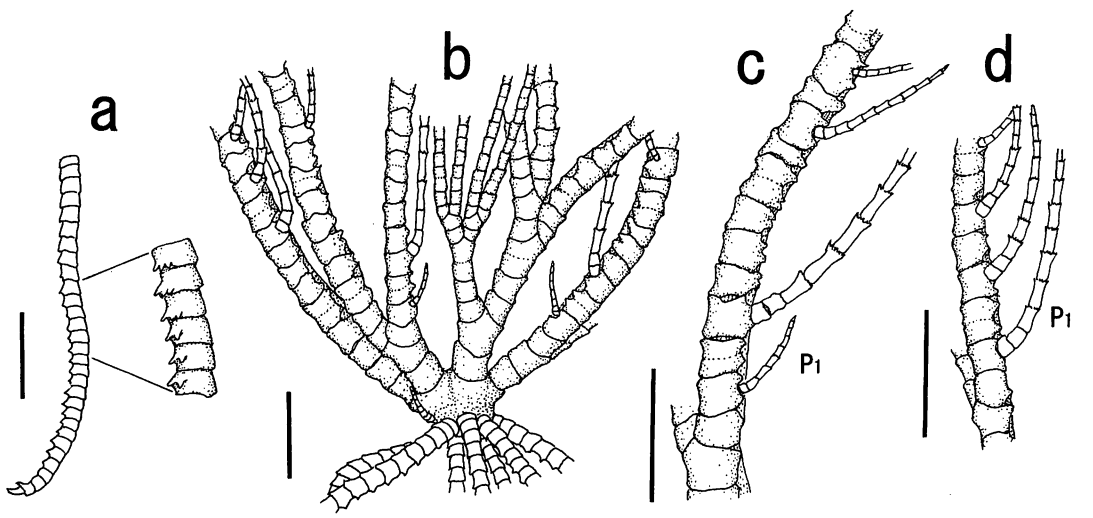

Fig. 9. *Basilometra boschmai* A. H. Clark, 1936 (Iv 3166). a, cirrus; b, centrodorsal and arm bases; c, proximal pinnules on an arm from IBr; d, proximal pinnules on an arm from IIIBr. Scale bar: 3 mm.

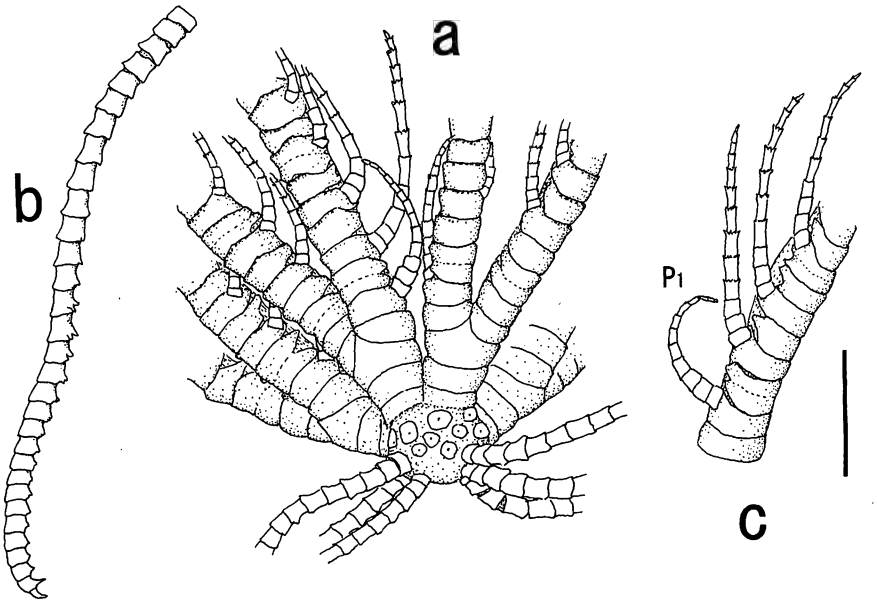

Fig. 10. *Colobometra discolor* A. H. Clark, 1909 (Iv 3178). a, centrodorsal and arm bases; b, a cirrus; c, proximal pinnules. Scale bar: 3 mm.

33. *Alisometra owstoni* (A. H. Clark, 1912)

Japanese name: Toge-shimofuri-umishida

Colobometra (Prometra) owstoni A. H. Clark, 1912a: 322.

Alisometra owstoni: A. H. Clark, 1947: 113, pl. 13 figs. 65-66; Utinomi & Kogo, 1968: 50 (list); Kogo, 1998: 74, fig. 60.

Material examined: Iv 3157 (1 juvenile specimen), North of Tokashikijima Isl., Ryukyu Isls., 26° 15.80'N, 127° 21.90'E, St. 11, 95-115 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999; Iv 3169 (1), Iv 3179 (1 juv.), Iv 3203 (1), Iv 3205 (1 juv.), Iv 3207 (2 juv.), Iv 3213 (1 juv.), Iv 3262 (6), & Iv 3285 (1 juv.), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 10 (except Iv 3262) in number, 32-54 mm long; cirri XVI-XX, 15-25 segments, each with a transverse ridge uniformly; ossicles of division series with blunt synarthrial tubercles, thickly expanded laterally; P_1, P_2, and also P_3 in case, stiff, elongated, 8-13 segments; P_2 slightly larger than P_1; most of basal segments of lower pinnules 2-3 times as long as broad, and distal ones with few spines at distal margin.

Remarks: Besides most specimens with 10 arms, a specimen (Iv 3262) has exceptionally 13 arms. Though no other morphological difference is recognized within them.

34. *Colobometra discolor* A. H. Clark, 1909 [Fig. 10]

New Japanese name: Aka-iboashi-umishida

Colobometra discolor A. H. Clark, 1909b: 640; 1947: 128, pl. 15 figs. 72-75, pl. 16 figs. 76-79.

Material examined: Iv 3178 (2 specimens), Iv 3238 (2), Iv 3247 (1), & Iv 3263 (1), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 10 in number, 32-54 mm long; cirri XIV-XX, 30-36 segments, 12-18 mm long; proximal cirrus segments bearing minute spines at distal margin, longest one slightly longer than broad, middle and distal ones with prominent paired dorsal spines; brachials of middle arm everted distally, fringed with a number of small spines; P_2 and P_3 markedly longer and stouter than other pinnules; lower segments of proximal pinnules carinated dorsally, middle and distal segments provided with prominent spines at distal margin; division series and arms colored in pale red longitudinally.

Remarks: This is the first record in Japanese waters, hitherto known from the Philippines and its neighboring seas (A. H. Clark, 1947).

35. *Decametra parva* (A. H. Clark, 1912)

Japanese name: Chibi-torafu-umishida

Prometra parva A. H. Clark, 1912c: 39.

Decametra parva: A. H. Clark, 1918: 121, pl. 20 fig. 46; 1947: 195, pl. 22 fig. 113; Utinomi & Kogo, 1965: 278; 1968: 50 (list); Kogo, 1998: 81, fig. 65.

Material examined: Iv 3134 (85 specimens), South of Iejima Isl., Ryukyu Isls., 26° 39.00'N, 127° 42.00'E, St. 9, 95 m in depth, dredge, 30 May 1999; Iv 3158 (7) & Iv 3167 (1 juvenile), North of Tokashikijima Isl., Ryukyu Isls., 26° 15.80'N, 127° 21.90'E, St. 11, 95-115 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999; Iv 3180 (1 juv.), Iv 3206 (1), & Iv 3282 (1), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 10 in number, 16-31 (20-30) mm long; centrodorsal discoidal or low hemispherical, 0.6-1.5 mm in diameter; cirri XII-XV, 11-15 segments, 3.0-4.0 mm long; each distal cirrus segment with a prominent spine; P_2 composed 8-11 segments, 2.2-4.3 mm long, 1.5 times longer than P_1 and P_3; middle segments of P_2 2-3 times longer than broad with a single or few prominent spines at distal margin; basal brachials of arm irregularly colored, not always, in pale red.

36. *Decametra multicirrala* sp. nov. [Fig. 11]

New Japanese name: Ashinaga-torafu-umishida

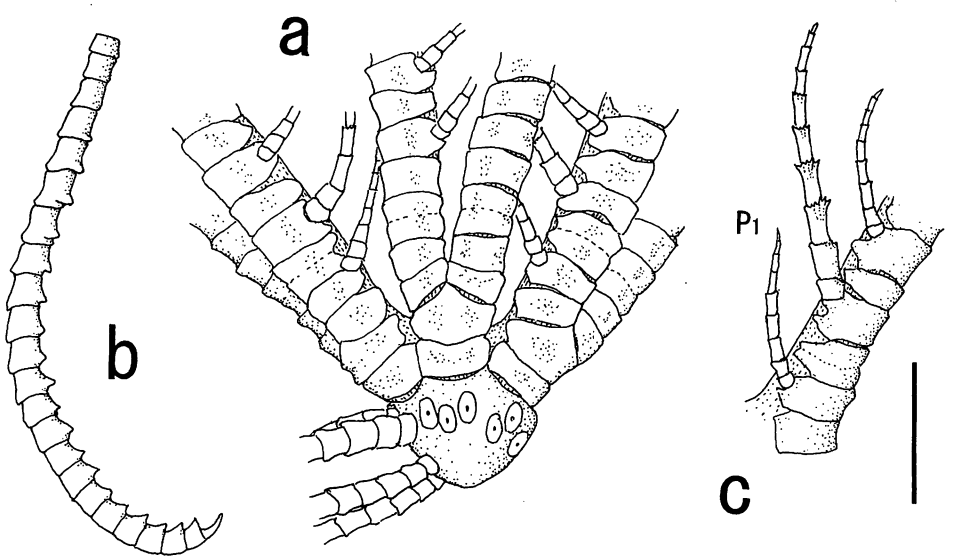

Fig. 11. Holotype of *Decametra multicirrala* sp. nov. (Iv 3160). a, centrodorsal and arm bases; b a cirrus; c, proximal pinnules. Scale bar: 2 mm.

Holotype: Iv 3160, North of Tokashikijima Isl., Ryukyu Isls., 26° 15.80'N, 127° 21.90'E, St. 11, 95-115 m in depth, dredge & sledge-net, collected by I. Kogo, 31 May 1999.

Paratypes: Iv 3159 (1 specimen), same locality and date as Iv 3160; Iv 3204 (1) & Iv 3278 (1), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, collected by I. Kogo, 31 May 1999.

Diagnosis: 10 arms. Cirri XII-XV, composed of 16-23 segments. Basal cirrus segments flared, middle ones with paired spines, and distal ones with a single spine. P_2 stiff, 10-11 segments, much larger than P_1 and P_3. Middle segments of P_2 2-3 times longer than broad with prominent spines at distal margin. Pa absent.

Description of holotype: Centrodorsal low hemispherical, 1.5 mm in diameter, 0.6 mm high, with a bare dorsal pole, 1.0 mm across. Cirri arranged in a single, partly 2 rows, XV, 18-22 segments, up to 8 mm long. First 2 cirrus segments not longer than broad, following ones increasing in length to slightly longer than broad, flared distally each with a transverse ridge at distal margin, middle ones reducing in length gradually each with a pair of dorsal spines, and distal ones coming to shorter than broad with a single spine. Radials belt-like. Division series and arm bases smooth. Arms 10 in number, 26 mm long, 0.5 mm wide at first syzygy. Brachials of middle arm not everted distally with oblique articulations. P_1 8-10 segments, 2.3-2.5 mm long; P_2 10-12, 4.0-4.3 mm; P_3 8-10, 2.5-2.7 mm; P_4 7-10, 2.2-2.5 mm; Pm 12, 2.5-3.0 mm; Pd 15, ca. 4.0 mm; Pa absent. Middle segments of P_2 everted distally and provided with prominent spines at distal margin. Comparative lengths of pinnules: $P_1 << P_2 > P_3 > P_4 < Pm < Pd$.

Etymology: The specific name is derived from the Latin meaning "many cirrus segments" in reference to the cirrus composed of many segments.

Remarks: This species is very close to *D. parva* except for the cirri. The cirri are composed of 11-15 segments, 3-4 mm long in *D. parva*, while in *D. multicirrala* of the same arm lengths, they have the cirri of 16-23 (mostly 18-21) segments, 6-8 mm long.

Family Calometridae

37. *Neometra multicolor* (A. H. Clark, 1907)

Japanese name: Nishiki-umishida

Antedon multicolor A. H. Clark, 1907b: 130.

Neometra multicolor: Gislén, 1922: 94, figs. 75-76; 1927: 30; A. H. Clark, 1947: 369, pl. 36 fig. 192; Utinomi & Kogo, 1968: 50 (list); Kogo, 1998: 86, fig. 70.

Material examined: Iv 3130 (1 specimen), Ohshima-Shinsone, Satsunan Isls., 28° 52.52'N, 129° 33.13'E, St. 7, 158 m in depth, dredge, I. Kogo coll., 29 May 1999; Iv 3143 (1 juvenile) & Iv 3144 (2), North of Tokashikijima Isl., Ryukyu Isls., 26° 15.80'N, 127° 21.90'E, St. 11, 95-115 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 10-20 (18-20) in number, up to 45 mm long; cirri XVI-XXIII, 19-36 (30-35) segments; Each IBr1 perfectly separated from neighboring ones by interradial extension of radials; P1 10-26 (20-24) segments, P2 stiff, longest pinnule, 8-16 (13-16) segments; pinnule segments of P2 uniformly carinated dorsally; first 2 segments of P1 gigantically larger than rest segments.

38. *Calometra callista* (A. H. Clark, 1907)

Japanese name: Yuhbi-umishida

Antedon callista A. H. Clark, 1907b: 135.

Calometra callista: Gislén, 1922: 96; A. H. Clark, 1947: 390, pl. 36 fig. 193; Utinomi & Kogo, 1965: 279, fig. 10; 1968: 50 (list); Kogo, 1998: 89, fig. 72.

Material examined: Iv 3296 (1 specimen), East of Ukejima Isl., Satsunan Isls., 27° 59.40'N, 129° 27.80'E, St. 13, 128 m in depth, dredge, I. Kogo coll., 1 June 1999.

Description: Arms 13 in number, 44 mm long; cirri long, coiled distally, XV, 37-43 segments, 20 mm in length; IBr1 contact with neighboring ones at base, not separated by interradial extensions of radials; P1 22 segments, P2 8-16 elongated segments with a tuft of spines at distal margins, slightly longer than P3; P4 and P5 resemble, 13 segments; whole pinnule segments uniformly carinated dorsally, triangular in cross section; first 2 segments of P1 gigantically larger than rest segments.

Family Asterometridae

39. *Pterometra trichopoda* (A. H. Clark, 1908)

Japanese name: Toge-ashinaga-umishida

Ptilometra trichopoda A. H. Clark, 1908b: 224.

Pterometra venusta: Tamura, 1983: 26, pl. 16 figs. 31-32.

Pterometra trichopoda: Gislén, 1922: 99, figs. 101-102; A. H. Clark, 1947: 421; Utinomi & Kogo, 1968: 50 (list); Liao & A. M. Clark, 1995: 56, fig. 31; Kogo, 1998: 91, fig. 73.

Material examined: Iv 3293 (1 specimen) & Iv 3295 (3), East of Ukejima Isl., Satsunan Isls., 27° 59.40'N, 129° 27.80'E, St. 13, 128 m in depth, dredge, I. Kogo coll., 1 June 1999.

Description: Arms 19-20 in number, about 30-40 mm long; centrodorsal truncated with 5 tubercles on dorsal pole; cirri arranged in 10 columns each with 1-3 (mostly 2) rows, exceedingly long, XIV-XXII, 43-66 segments; each proximal cirrus segment with a ventral spine at distal edge; radials excessively shorter than long; ossicles of division series and brachials with prominent middorsal keel; P_1 shortest, 8-11 segments, and following pinnules similar.

40. *Asterometra anthus* (A. H. Clark, 1907)

Japanese name: Minami-ashinaga-umishida

Antedon anthus A. H. Clark, 1907b, 136.

Asterometra anthus:A. H. Clark, 1918: 141 (key); 1947: 444, pl. 36 fig. 194, pl. 41 figs. 212-214, pl. 42 fig. 215; Gislén, 1922: 103, figs. 92-98; 1927: 42; Utinomi & Kogo, 1968: 50 (list); Kogo, 1998: 97, fig. 78.

Material examined: Iv 3142 (1 specimen), Iv 3151 (1), & Iv 3152 (1 juvenile), North of Tokashikijima Isl., Ryukyu Isls., 26° 15.80'N, 127° 21.90'E, St. 11, 95-115 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999; Iv 3292 (1), East of Ukejima Isl., Satsunan Isls., 27° 59.40'N, 129° 27.80'E, St. 13, 128 m in depth, dredge, I. Kogo coll., 1 June 1999.

Description: Arms 10 in number, 10-30 (26-30) mm long; radials nearly as long as broad, rounded dorsally; cirri arranged in 10 columns each with 1-2 rows, exceedingly long, XIV-XX, 24-55 (usually more than 50) segments, 8-28 (20-28) mm in length; proximal cirrus segments without ventral spine, distal ones each with a sharp dorsal spine; ossicles of division series and lower brachials rounded dorsally without middorsal keel; P_1 shortest pinnule, 7-9 segments, then following pinnules gradually increasing in length.

Suborder Macrophreatina

Family Antedonidae

41. *Dorometra parvicirra* (Carpenter, 1888)

Japanese name: Yukari-umishida

Antedon parvicirra Carpenter, 1888b: 204, pl. 36 figs. 7-8.

Dorometra parvicirra: A. H. Clark, 1918: 215 (key), 216; Gislén, 1922: 137, figs. 125-127; A. H. Clark & A. M. Clark, 1967: 63; Utinomi & Kogo, 1968: 51 (list); Kogo, 1998: 118, fig. 117; Pilcher & Messing, 2001: 16 (list).

Material examined: Iv 3155 (6 specimens) & Iv 3156 (1), North of Tokashikijima Isl., Ryukyu Isls., 26° 15.80'N, 127° 21.90'E, St. 11, 95-115 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999; Iv 3175 (1), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 10 in number, 25-26 mm long; centrodorsal hemispherical with dorsal pole papillose; cirri fragile, XXVII-XXXV, 8-16 (12-16) segments without spine, 3-9 mm long; longest cirrus segments 2-3 times as long as broad; IBr2 (axillary) rhombic; P1 6-12 (9-12), 2.0-3.5 mm, P2 7-16, 3.0-5.0 mm, P3 longest pinnule, 13-16, 3.8-6.0 (5.0-6.0) mm, 1.5-2 times longer than P1; longest pinnule segments of P3 3-4 times as long as broad. Comparative lengths of pinnules: P1<P2<P3>P4>P5<Pm<Pd.

42. *Dorometra briseis* (A. H. Clark, 1907) [Fig. 12]

New Japanese name: Hime-yukari-umishida.

Antedon briseis A. H. Clark, 1907a: 83.

Dorometra briseis: Gislén, 1922: 135, figs. 120-122; A. H. Clark & A. M. Clark, 1967: 75.

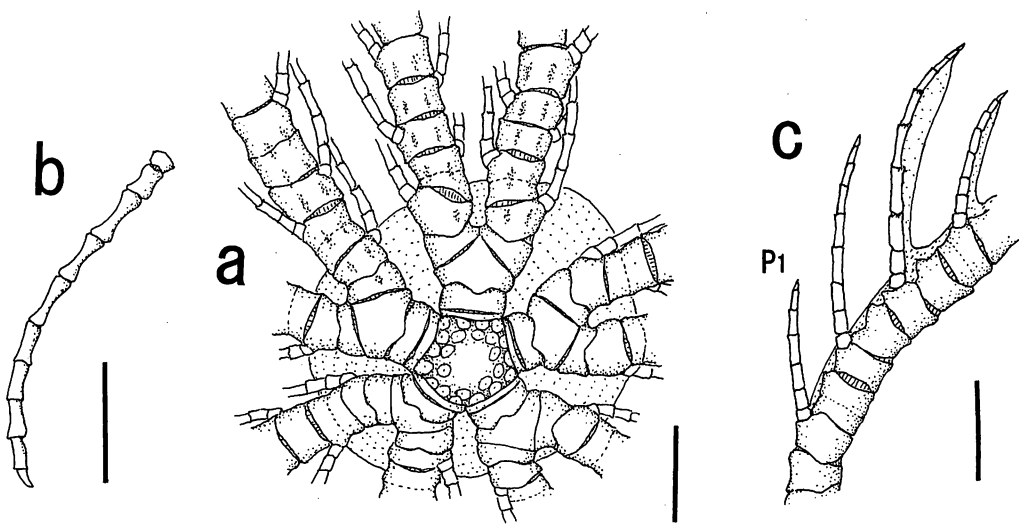

Fig. 12. *Dorometra briseis* (A. H. Clark, 1907) (Iv 3153). a, centrodorsal and arm bases; b, a cirrus; c, proximal pinnules. Scale bar: 1 mm.

Material examined: Iv 3153 (2 specimens), Iv 3154 (1), & Iv 3164 (1), North of Tokashikijima Isl., Ryukyu Isls., 26° 15.80'N, 127° 21.90'E, St. 11, 95-115 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 10 in number, 25-30 mm long; cirri XXII-XXX, 8-12 segments; longest cirrus segment 3-5 times as long as median constricted width; brachials of middle arm smooth; P_1 6-10 segments, 1.0-2.0 mm long, P_2 7, 1.0-1.8 mm, P_3 longest pinnule, 7-10, 1.5-2.7 mm, 1.5 times longer than P_1. Comparative lengths of proximal pinnules: $P_1=P_2<<P_3>>P_4$.

43. *Dorometra aphrodite* (A. H. Clark, 1912)

Japanese name: Hishibushi-umishida

Iridometra aphrodite A. H. Clark, 1912d: 137.

Eumetra aphrodite: Gislén, 1927: 45, figs. 38-39; Utinomi & Kogo, 1965: 282, fig. 12; A. H. Clark & A. M. Clark, 1967: 80.

Dorometra aphrodite: Liao & A. M. Clark, 1995: 61, fig. 35 (new combination); Kogo, 1998: 119, fig. 95.

Material examined: Iv 3183 (1specimen) & Iv 3256 (1), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 10 in number, 35-46 mm long; cirri fragile, XXII-XXX, 15-17 segments without dorsal spine; longest cirrus segment about 2 times as long as broad; brachials of middle arm with spiny distal margins; P_1 12-14 segments, 3.5-4.5 mm long, P_2 13-14, 5.5-6.2 mm, P_3 longest pinnule, 20-22, 10.0-10.5 mm, 2-3 times as long as P_1; middle segments of P_3 everted distally and fringed with minute spines at distal margins. Comparative lengths of proximal pinnules: $P_1<P_2<P_3>>P_4$.

44. *Euantedon exquisita* (A. H. Clark, 1909) [Fig. 13]

New Japanese name: Komahime-umishida

Iridometra exquisita A. H. Clark, 1909a: 408; 1918: 213.

Euantedon exquisita: A. H. Clark & A. M. Clark, 1967: 103; Kogo, 1998: 122, fig. 99.

Material examined: Iv 3150 (1 specimen), North of Tokashikijima Isl., Ryukyu Isls., 26° 15.80'N, 127° 21.90'E, St. 11, 95-115 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description: Arms 10 in number, 17 mm long; cirri excessively fragile and elongated, ca. L, 14 segments, 7.5 mm long; longest cirrus segments 5-6 times as long as median width, middle ones slightly expanded distally; ossicles of division series with prominent articular tubercles; IBr_2 (axillary) rhombic; P_1 11-12 segments, 3.8 mm long, much longer than P_2, P_2 7-9, 2.0-2.9 mm, P_3 7-8, 1.5 mm with gonads; segments of proximal pinnules elongated, 2-3 times as long as broad, fringed with prominent spines at distal margins. Comparative lengths of proximal pinnules: $P_1>P_2>P_3=P_4$.

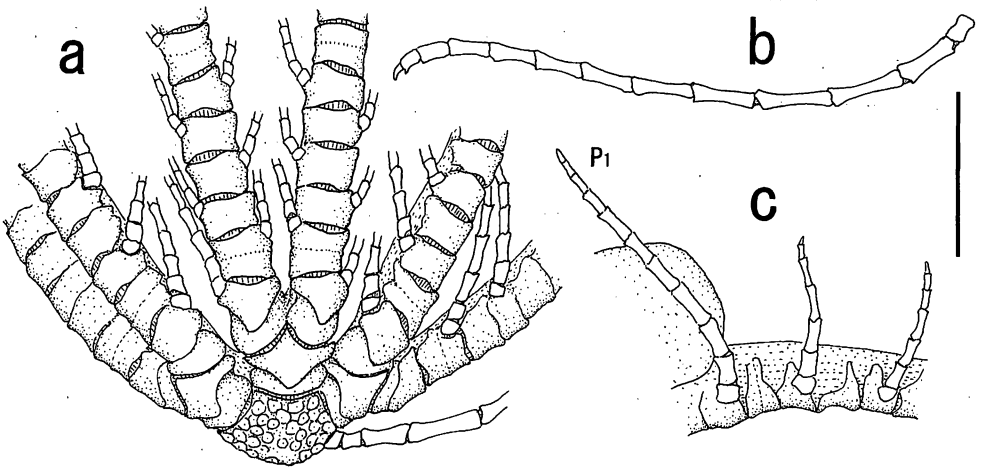

Fig. 13. *Euantedon exquisita* (A. H. Clark, 1909) (Iv 3150). a, centrodorsal and arm bases; b, a cirrus; c, proximal pinnules. Scale bar: 2 mm.

45. ***Euantedon sinensis* A. H. Clark, 1912** [Fig. 14]

New Japanese name: Mahime-umishida.

Euantedon sinensis A. H. Clark, 1912b: 31; A. H. Clark & A. M. Clark, 1967: 105; Liao & A. M. Clark, 1995: 7 (list).

Material examined: Iv 3149 (3 specimens), North of Tokashikijima Isl., Ryukyu Isls., 26° 15.80'N, 127° 21.90'E, St. 11, 95-115 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999; Iv 3284 (1), South of Nagannu Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, St. 12, 50-53 m in depth, dredge & sledge-net, collected by I. Kogo, 31 May 1999.

Description: Arms 10 in number, 22-23 mm long; cirri short, ca. XX-XXX, 8-9 segments, 3.2-4.0 mm long; longest cirrus segments 2.5 times as long as median width; ossicles of division series smooth; IBr2 (axillary) broad pentagonal; proximal pinnules stout and stiff with spiny distal margins; P_1 11-12 segmenets composed of much elongated segments, about 4 times as long as broad, 5.2-5.8 mm long, much longer than P_2, P_2 9 segments, 3.0-3.2 mm, P_3 7 segments, 1.5 mm. Pa sometimes absent. Comparative lengths of proximal pinnules: $P_1 >> P_2 >> P_3 = P_4$.

Remarks: According to the description by A. H. Clark & A. M. Clark (1967), this species has 10 arms of 60 mm long, and the cirri composed of 15-17 segments of 13-15 mm long, while the present specimens has the arms only 23 mm long, and the cirri composed of 8-9 segments of 3.2-4.0 mm long. It is probably because they are young, in spite of having gonads already. This is the first record in Japanese waters, hitherto known only from the coast of China (A. H. Clark & A. M. Clark, 1967).

46. ***Antedon parviflora* (A. H. Clark, 1912)**

Japanese name: Hime-umishida

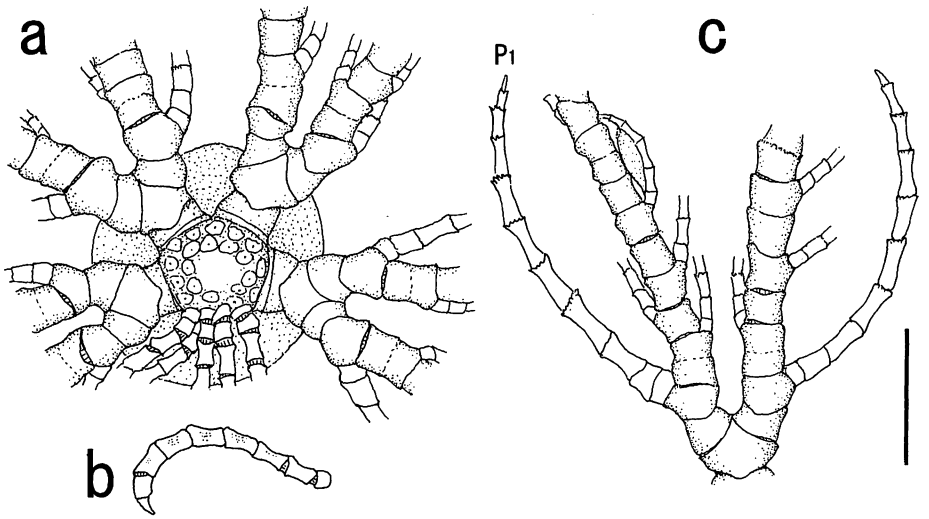

Fig. 14. *Euantedon sinensis* A. H. Clark, 1912 (Iv 3149). a, centrodorsal and arm bases; b, a cirrus; c, proximal pinnules. Scale bar: 2 mm.

Compsometra parviflora A. H. Clark, 1912d: 133; 1918: 205 (key), 227, pl. 25 figs. 80-81; Gislēn, 1922: 124, figs. 109-113.

Antedon parviflora: A. H. Clark and A. M. Clark, 1967: 147, figs. 9b-9c; Utinomi & Kogo, 1968: 52 (list); A. M. Clark, 1972: 141; Liao & A. M. Clark, 1995: 59, fig. 33; Kogo, 1998: 123, fig. 100.

Material examined: Iv 3147 (2 specimens), North of Tokashikijima Isl., Ryukyu Isls., 26° 15.80'N, 127° 21.90'E, St. 11, 95-115 m in depth, dredge & sledge-net, I. Kogo coll., 31 May 1999.

Description (larger specimen): Arms 10 in number, 21 mm long; cirri short, ca. XXVIII, 9-10 segments 3.2 mm long; cirrus segments much elongated, about 3 times as long as median width; ossicles of division series and first 2 brachials with rounded synarthrial tubercles; P_1 longest pinnule, 7-8 segments, 1.5-1.8 mm long, about 1.5 times as long as P_2, P_2 6 segments, 0.9-1.3 mm, P_3 with gonad, 8 segments, 1.5 mm. Comparative lengths of proximal pinnules: $P_1 >> P_2 < P_3 = P_4$.

Key of the crinoids found in the Nansei Islands and neighboring seas

This key includes the shallow-water crinoids within the depth of 200 meters recorded from the Nansei Islands and neighboring seas including Kyushu region, East China Sea and Ogasawara Islands. This is based mainly on the monographs by A. H. Clark (1931, 1941, 1947, 1950) and A. H. Clark & A. M. Clark (1967), and partly, particularly in case of the family Comasteridae, on the revision by Rowe et al. (1986) and the key by Messing (2001).

The species described in this paper are shown in bold letters, and others in normal letters with the author's name and year.

[1] Key to the families

1a Only 5 arms ····· Family Eudiocrinidae (p. 35)
1b Arms 10 or more in number ····· 2
2a Proximal pinnules with combs ····· Family Comasteridae (p. 32)
2b Proximal pinnules without comb ····· 3
3a Ossicles of IBr series connected by syzygy ····· Family Zygometridae (p. 35)
3b Ossicles of IBr series connected by synarthry ····· 4
4a Cirrus segments each with a transeverse ridge or paired spines ····· Family Colobometridae (p. 37)
4b Cirrus segments with a single or no spine ····· 5
5a Cross section of pinnule round ····· 6
5b Cross section of pinnule triangular ····· 8
6a Arms always 10 in number ····· Family Antedonidae (p. 39)
6b More than 10 arms ····· 7
7a Division series all 2 ····· Family Mariametridae (p. 36)
7b Division series mostly 2 except IIBr series 4(3+4) ····· Family Himerometridae (p. 36)
8a Arms and cirri exceedingly large and stout; 10 arms ····· Family Tropiometridae (p. 38)
8b Arms and cirri small and slender ····· 9
9a Cirri short, fewer than 25 segments ····· Family Charitometridae (p. 39)
9b Cirri long, more than 25 segments ····· 10
10a First 2 segments of P_1 enormously larger than other segments ····· Family Calometridae (p. 38)
10b First 2 segments of P_1 not enormously larger than other segments ····· 11
11a P_1 stouter and longer than P_2 ····· Family Thalassometridae (p. 38)
11b P_1 similar to P_2, but shorter ····· Family Asterometridae (p. 38)

[2] Key to the species
Family Comasteridae

1a Only 10 arms ····· 2
1b More than 10 arms ····· 10
2a Some proximal pinnules (P_1-P_4, Pb-Pd) absent ····· an undetermined species (see below *)
2b All proximal pinnules present ····· 3
3a Distal cirrus segments with dorsal spines ····· 4
3b Distal cirrus segments without dorsal spine ····· 8
4a Combs with more than 20 teeth ····· ***Alloeocomatella pectinifera*** (p. 6, see below**)
4b Combs with less than 20 teeth (Genus *Comissia*) ····· 5

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* This species reported as *Comatilia careopinna* sp. nov. by Kogo in 1998, is regarded as an unidentified juvenile of multibrachiate comasterid (Messing, 2001).

** This species was once misidentified *Comissia magnifica* Gislēn by Kogo (1998). It should be referred to *Alloeocomatella pectinifera* A. H. Clark according to Messing (2001).

5a Cirri more than XX, 7-9 mm long; arms up to 45 mm long ·····6
5b Cirri less than XX, 4-6 mm long; arms less than 40 mm long ·····7
6a Distal edges of ossicles of division series produced with prominent spines
·····*Comissia spinosissima* A. H. Clark, 1912
6b Distal edges of ossicles of division series smotth without spines
·····*Comissia parvula* A. H. Clark, 1912
7a Arms 30-40 mm long; antepenultimate cirrus segment about 1.5 times as long as broad
·····*Comissia gracilipes* A. H. Clark, 1912
7b Arms about 20 mm long; antepenultimate cirrus segment as long as broad, or slightly longer
·····*Comissia minuta* Gislēn, 1922
8a Ossicles of IBr series and first 2 brachials longer and narrow, free laterally
·····***Comatulides decameros*** (p. 7)
8b Ossicles of IBr series and first 2 brachials short and very broad, in close apposition with neighbors (Genus *Comatula*)·····9
9a Cirri with 16-18 segments ·····*Comatula solaris* Lamarck, 1816
9b Cirri with 10-14 segments·····***Comatula pectinata*** (p. 7)
10a First syzygy on arm arising at Br2+3 (Genus *Capillaster*)·····11
10b First syzygy on arm arising at Br1+2, or Br3+4 ·····12
11a Ossicles of division series and basal brachials smooth distally ·····***Capillaster mariae***(p. 5)
11b Ossicles of division series and basal brachials robust distally
·····***Capillaster multiradiatus*** (p. 6)
12a First syzygy on arms arising from IIBr at Br1+2 ·····13
12b First syzygy on arms arising from IIBr at Br3+4 ·····23
13a All division series 2·····14
13b Some division series 4(3+4) (Genus *Phanogenia*) ·····19
14a Pinnule combs arising as far as P_4 to P_8, each with 20-39 teeth
·····*Alloeocomatella polycladia* Messing, 1995
14b Pinnule combs arising as far as P_5, each with 14-18 teeth (Genus *Comatella*) ·····15
15a Cirrus segments usually 25-30 ·····***Comatella nigra*** (p. 4)
15b Cirrus segments fewer than 25 ·····16
16a Arms 30-40 in number; cirri 20-25 segments ·····***Comatella stelligera*** (p. 4)
16b Arms 20 or fewer in number; cirri less than 20 segments ·····17
17a Cirri with 15-20 segments; usually about 20 arms ····· *Comatella maculata* (Carpenter, 1888)
17b Cirri less than than 13 segments ·····18
18a Combs extending to P_6; P_1 about 40 segments with 12 teeth
·····*Comatella decora* A.H.Clark, 1912
18b Combs confined within P_1-P_3; P_1 22-28 segments with 7-9 teeth
·····*Comatella brachycirra* Gislēn, 1922
19a Usually more than 80 arms in adults ·····***Phanogenia multibranchiata*** (p. 7)
19b Usually less than 60 arms in adults ·····20

20a Centrodorsal without cirrus, excessively reduced ····· *Phanogenia gracilis* (Hartlaub, 1890)
20b Centrodorsal with cirri, not reduced ····· 21
21a About 40 or more arms; cirri about XXX, 12-13 segments
····· *Phanogenia shoenovi* (A. H. Clark, 1918)
21b Less than 40 arms ····· 22
22a Arms 30-40 (mostly 27-37) in number; combs with 8-12 teeth ··· ***Phanogenia brevicirra*** (p. 8)
22b Arms up to 30 (mostly 15-24) in number; combs with 5-8 teeth
····· ***Phanogenia serrata*** (p. 8)
23a Usually outer IIIBr 2 and inner IIIBr 4(3+4) (Genus *Comaster*) ····· 24
23b No regularity in IIIBr series, 2 or 4(3+4) occurring ····· 25
24a Combed pinnules usually extending to P_5-P_8 ····· ***Comaster nobilis*** (p. 9)
24b Combed pinnules confined to P_3-P_4 ····· *Comaster schlegelii* (Carpenter, 1881)
25a Comb teeth confluent ····· 26
25b Comb teeth not confluent (Genus *Oxycomanthus*)····· 33
26a Pinnule combs extending beyond P_2 (Genus *Comanthus*) ····· 27
26b Pinnule combs confined within P_2 (Genus *Clarkcomanthus*)····· 31
27a Arms many, usually more than 50 (up to 150) in number ····· 28
77b Arms less than 50 in number ····· 29
28a IIIBr series twisted, usually 2; cirri absent in adults ·····***Comanthus alternans*** (p. 9)
28b IIIBr series not twisted, 2 or 4(3+4); cirri present····· *Comanthus briareus* (Bell, 1882)
29a Radials obscured by prominent centrodorsal with well-developed cirri, XIII-XL, 12-18
segments·····*Comanthus wahlbergii* (Müller, 1893)
29b Radials clearly visible ····· 30
30a Arm number 30-40 in adults; middle segments of distal pinnule with spines at distal edges
·····***Comanthus gisleni*** (p. 10)
30b Arm number 40-63 in adults; middle segments of distal pinnule without spines at distal edges
····· ***Comanthus parvicirrus*** (p. 10)
31a Centrodorsal prominent with developed cirri, IX-XXVI, 12-17 segments
·····*Clarkcomanthus luteofuscum* (H. L. Clark, 1915)
31b Centrodorsal reduced, with or without cirri ····· 32
32a Some segments of pinnule bearing on IIBr series longer than broad; cirri 0-VI, 8-13 segments
·····*Clarkcomanthus albinotus* Rowe et al., 1986
32b Segments of pinnule bearing on IIBr series never longer than broad; cirri 0-XXI, 9-15
segments·····*Clarkcomanthus littoralis* (Carpenter, 1888)
33a Centrodorsal large, hemispherical or thick discoidal; cirri developed, more than XXX ·····34
33b Centrodorsal small, thin discoidal; cirri, when present, small and week, less than XXV ·····39
34a IIIBr series usually 2, very exceptionally 4(3+4) ····· 35
34b IIIBr series usually 4(3+4) ····· 36
35a Centrodorsal large, up to 12 mm across; cirri XXX-LXX, 22-30 segments, 20-30 mm long
·····*Oxycomanthus imbricatus* (A. H. Clark, 1908)

35b Centrodorsal small, 7-9 mm across; cirri up to XXXII, 20-28 segments, 18-30 mm long ····· *Oxycomanthus intermedius* (A. H. Clark, 1916)
36a Cirri very stout and long, 25-35 segments, more than 30 mm long ····· 37
36b Cirri less stout, up to 25 segments, less than 25 mm long ····· 38
37a Arms 31-120 in number; longest cirrus exceeding 40 mm long ····· *Oxycomanthus bennetti* (Müller, 1841)
37b Arms 25-49 in number; longest cirrus 30-40 mm long ····· *Oxycomanthus piguis* (A. H. Clark, 1909)
38a Basal segments of proximal pinnules carinated dorsally ····· *Oxycomanthus solaster* (A. H. Clark, 1907)
38b Basal segments of proximal pinnules rounded dorsally ····· *Oxycomanthus japonicus* (Müller, 1841)
39a Cirri 24-25 segments; middle pinnules with combs ····· *Oxycomanthus delicatus* (A. H. Clark, 1909)
39b Cirri 10-14 segments; middle pinnules without comb ····· 40
40a Combs occurring as far as P_2 ····· ***Oxycomanthus comanthipinna*** (p. 11)
40b Combs confined to only P_1 ····· ***Oxycomanthus exilis*** (p. 11)

Family Zygometridae

1a Cirrus segments with prominent spines; less than 25 arms ····· ***Zygometra comata*** (p. 13)
1b Cirrus segments without spine (Genus *Catoptometra*) ····· 2
2a Arms 30-80 in number; IIBr series 2 ····· ***Catoptometra magnifica*** (p. 13)
2b Arms less than 30 in number; IIBr series 4(3+4) ····· 3
3a Cirri shorter, few or none of segments longer than broad; 11-14 arms ····· *Catoptometra rubroflava* (A. H. Clark, 1907)
3b Cirri longer, longest segment twice as long as broad; 20 or more arms ····· *Catoptometra hartlaubi* (A. H. Clark, 1909)

Family Eudiocrinidae

1a Brachials strongly everted dorsally ····· ***Eudiocrinus venustulus*** (p. 15)
1b Brachials mostly smooth dorsally ····· 2
2a Longest cirrus segments 1.5-2 times as long as broad ····· 3
2b Longest cirrus segments almost as long as broad ····· 4
3a Third segment of P_1 and Pa not longer than broad ····· ***Eudiocrinus indivisus*** (p. 15)
3b Third segment of P_1 and Pa about 1.5 times as long as broad ····· *Eudiocrinus pulchelus* Gislén, 1922
4a Third and fourth segments of Pa 1.5 times as long as broad ····· ***Eudiocrinus loveni*** (p. 14)
4b Third and fourth segments of Pa broader than long ····· *Eudiocrinus variegatus* A. H. Clark, 1908

Family Himerometridae

1a P_1 longer than P_2 (Genus *Himerometra*)..... 2
1b P_1 shorter than P_2 3
2a Proximal pinnules very stiff; P_1 with about 20 segments
.....*Himerometra robustipinna* (Carpenter, 1881)
2b Proximal pinnules slender, flagellate distally; P_1 with about 30 segments
.....***Himerometra bartschi*** (p. 16)
3a Arms 10-20 in number; cirri with 21-32 segments .....***Heterometra schlegelii*** (p. 17)
3b Arms always 10 in number; cirri with 17-23 segments .....***Amphimetra laevipinna*** (p. 17)

Family Mariametridae

1a Ossicles of division series covered with crowded small spines (Genus *Mariametra*)..... 2
1b Ossicles of division series smooth without spines 4
2a About 40 arms; P_3 and P_4 similar, with 16-20 segments
.....*Mariametra subcarinata* (A. H. Clark, 1908)
2b Less than 30 arms; a narrow median dark stripe on division series and arms 3
3a Cirri XX-XXV, outer cirrus segments not longer than broad
.....***Mariametra vicaria*** (p. 21)
3b Cirri about XXX, outer cirrus segments longer than broad
..... *Mariametra delicatissima* (A. H. Clark, 1907)
4a Cirri nearly 50 segments .....***Oxymetra finschii*** (p. 18)
4b Cirri fewer than 40 segments 5
5a Proximal pinnules stiffened (Genus *Stephanometra*) 6
5b Proximal pinnules tapering distally 8
6a Outer cirrus segments without dorsal spines .....***Stephanometra spicata*** (p. 18)
6b Outer cirrus segments with prominent dorsal spines.....7
7a Arms 33-40 (usually 30-35) in number; cirri 25-37 segments
.....*Stephanometra echinus* (A. H. Clark, 1908)
7b Arms 16-24 in number; cirri about 20 segments
..... *Stephanometa tenuipinna* (Hartlaub, 1840)
8a Both P_2 and P_3 elongated, similar in length (Genus *Liparometra*) 9
8b P_2 or P_3 elongated, not same length 10
9a P_2 with 16-23 segments; cirri 17-31 segments..... ***Liparometra articulata*** (p. 19)
9b P_2 with 19-23 segments; cirri nearly 40 segments .....***Liparometra grandis*** (p. 19)
10a P_2 longer than P_3; cirri 15-25 segments .....***Lamprometra palmata*** (p. 20)
10b P_3 longer than P_2 (Genus *Dichrometra*).....11
11a About 20 arms; P_3 much longer and stouter than P_2
.....*Dichrometra stylifer* (A. H. Clark, 1907)
11b More than 20 (up to 50) arms; P_3 not much longer than P_2
.....***Dichrometra doederleini*** (p. 20)

Family Colobometridae

1a Arms more than 40 in number (more than 7 arms a ray)·····2
1b Arms less than 40 in number·····3
2a Division series all 2; P_1 much longer and stouter than P_2 and P_3
·····*Pontiometra andersoni* (Carpenter, 1889)
2b IIBr series (3+4), P_1, P_2, and P_3 similar and same length
····· ***Basilometra boschmai*** (p. 22)
3a Arms more than 10 (12-39) in number ·····4
3b Arms mostly 10 (10-12) in number ·····5
4a P_2 hornlike, abruptly larger and stiffer than P_1 and P_3
·····*Cenometra bella* (Hartlaub, 1890)
4b P_2 not hornlike, slightly longer and stouter than P_1 and P_3
·····*Cyllometra manca* (Carpenter, 1888)
5a Arms 10-12 in number; P_1-P_3 similar, but P_2 slightly stouter than others
····· *Iconometra japonica* (Hartlaub, 1890)
5b Arms always 10 in number ·····6
6a P_1 and Pa absent ·····*Clarkometra elegans* Gislén, 1922
6b P_1 or Pa, or both present ·····7
7a Distal edges of proximal cirrus segments fringed with spines (Genus *Colobometra*) ·····8
7b Distal edges of proximal cirrus segments smooth·····9
8a Cirri very long, more than 40 (up to 65) segments
····· *Colobometra perspinosa* (Carpenter, 1881)
8b Cirri long, less than 40 (mostly 30-35) segments·····***Colobometra discolor*** (p. 23)
9a P_1, P_2, and P_3 similar in length, composed of segments with spinous distal ends
·····***Alisometra owstoni*** (p. 23)
9b P_1 shorter than P_2, composed of segments without spines·····10
10a Cirrus segments each with a transverse ridge; Pa present (Genus *Oligometra*)·····11
10b Cirrus segments each with paired dorsal spines or a single spine; Pa absent
(Genus *Decametra*)·····12
11a P_2 much longer and stouter than P_1 and P_3; cirri with 18-26 segments
····· *Oligometra serripinna* (Carpenter, 1881)
11b P_2 slightly longer and stouter than P_1 and P_3; cirri with 20-30 segments
·····*Oligometra chinensis* A. H. Clark, 1918
12a P_2 12-20 segments ····· *Decametra tigrina* (A. H. Clark, 1907)
12b P_2 10-11 segments, and distal ones with prominent spines ·····13
13a Cirri about XIV, 11-15 segments, 5.5 mm long ·····***Decameta parva*** (p. 24)
13b Cirri XII-XV, 16-23 segments, 7.5-8.0 mm long ·····***Decameta multicirrala*** sp. nov. (p. 24)

Family Tropiometridae

Large species with 10 arms; uniformly black (occationally pale yellow) in color
……*Tropiometra afra macrodiscus* (Hara, 1895)

Family Calometridae

1a P_2 and following pinnules comparatively short, same length; 10-15 arms
……***Calometra callista*** (p. 26)
1b P_2 or P_3 or both longer than following pinnules ……2
2a Division series in lateral contact, with lateral expansions
……*Pectinometra flavopurpurea* (A. H. Clark, 1907)
2b Division series separating each other, without lateral expansion ……3
3a Interradial expansion of radials not developed; bases of IBr series closing laterally; 20 arms
…… *Gephyrometra versicolor* (A. H. Clark, 1907)
3b Interradial expansion of radials developed; bases of IBr series separating widely; up to 20 arms…… ***Neometra multicolor*** (p. 26)

Family Asterometridae

1a Arms 20-30 in number (Genus *Pterometra*)……2
1b Arms 10-16 in number (Genus *Asterometra*) ……3
2a Prominent ventral spines arising at proximal cirrus segments; 20-30 arms
……***Pterometra trichopoda*** (p. 27)
2b No ventral spine at proximal cirrus segments; 20 arms
…… *Pterometra pulcherrima* (A. H. Clark, 1909)
3a Ossicles of division series and first 2 brachials smoothly convex dorsally; 10-16 arms
…… ***Asterometra anthus*** (p. 27)
3b Ossicles of division series and first 2 brachials each with a median keel or line ……4
4a Axillaries with three pointed tubercles; always 10 arms
……*Asterometra longicirra* (Carpenter, 1888)
4b Axillaries without any tubercle; median keel reduced to a slightly raised lines; 10-12 arms
……*Asterometra macropoda* (A. H. Clark, 1907)

Family Thalassometridae

1a Division series and arm bases narrow, laterally compressed and carinate ……2
1b Division series and arm bases more or less flattened, never carinate ……4
2a Arms 10-18 (usually 10-15) in number …… *Daidalometra hana* (A. H. Clark, 1907)
2b Arms always 20 in number (Genus *Stenometra*) ……3
3a Ossicles of division series and arm bases everted and denticulate or spinous
……*Stenometra dentata* Gislēn, 1922
3b Ossicles of division series and arm bases not everted and not spinous
……*Stenometra diadema* (A. H. Clark, 1907)

4a Cirri XVII-XXI, 15-25 (up to 27) segments; 10-20 (mostly 12-14) arms ····· *Parametra orion* (A. H. Clark, 1907)

4b Cirri X-XL, 30-38 segments; usually 20 arms ····· *Lissometra alboflava* (A. H. Clark, 1907)

Family Charitometridae

1a Genital pinnules with slightly broadened earlier segments, and tapering to delicate tip; 20-33 arms ····· *Glyptometra septentrionalis* (A. H. Clark, 1911)

1b Genital pinnules with much broadened earlier segments, abruptly ended ····· 2

2a Centrodorsal conical, higher than broad at base; 14-20 arms ····· *Chlorometra garrettiana* (A. H. Clark, 1907)

2b Centrodorsal hemispherical, not higher than broad at base; 10 arms ····· 3

3a Ossicles of division series and arm bases compressed laterally; cirri more than 15 segments ····· *Poecilometra scalaris* (A. H. Clark, 1907)

3b Ossicles of division series and arm bases not compressed laterally; cirri less than 15 segments ····· *Strotometra hepburniana* (A. H. Clark, 1907)

Family Antedonidae

1a Cirri more than 20 segments ····· 2

1b Cirri fewer than 20 segments ····· 5

2a P_2 similar to P_3, differing from succeeding pinnules; all proximal pinnules present ····· *Boleometra clio* (A. H. Clark, 1907)

2b P_1 similar to P_2; P_1 and Pa sometimes absent ····· 3

3a Synarthrial tubercles excessively produced dorsally ····· *Perometra diomedeae* (A. H. Clark, 1907)

3b Synarthrial tubercles not produced dorsally ····· 4

4a Interradial perisome naked; Pa always present ····· *Nanometra bowersi* (A. H. Clark, 1907)

4b Interradial perisome with numerous calcareous nodules; Pa usually absent ····· *Erythrometra rubra* (A. H. Clark, 1907)

5a P_1, P_2, and P_3 almost same length ····· *Iridometra adrestine* (A. H. Clark, 1907)

5b P_1, P_2, and P_3 not same length ····· 6

6a P_1 much longer than both P_2 and P_3 ····· 7

6b P_1 not longer than both P_2 and P_3 ····· 10

7a P_3 distinctly shorter than P_2 (Genus *Euantedon*) ····· 8

7b P_3 similar to P_2 in length (Genus *Antedon*) ····· 9

8a Cirri about 15 segments; longest cirrus segment 4-6 times as long as broad ····· ***Euantedon exquisita*** (p. 29)

8b Cirri 8-17 segments; longest cirrus segment 2-2.5 times as long as broad ····· ***Euantedon sinensis*** (p. 30)

9a Segments of proximal pinnules with prominent spines at distal ends ····· *Antedon serrata* A. H. Clark, 1907

9b Segments of proximal pinnule without prominent spines at distal ends ..... *Antedon parviflora* (p. 30)

10a P_2 slightly longer than P_3, with 11-13 segments; outer segments with prominent spines at distal ends ..... *Andrometra psyche* (A. H. Clark, 1907)

10b P_3 longer than P_2 11

11a P_3 and P_4 similar, slightly longer than P_2; P_1 with about 18 segments ..... *Annametra minuta* (A. H. Clark, 1907)

11b P_3 longest pinnule, apparently longer than P_2 (Genus Dorometra) 12

12a P_2 intermediate in size and in number of segments between P_1 and P_3 13

12b P_2 similar to P_1, or somewhat smaller 14

13a P_3 20 or more segments; cirri 15-17 segments ..... ***Dorometra aphrodite*** (p. 29)

13b P_3 13-20 segments; cirri 12-17 segments ..... ***Dorometra parvicirra*** (p. 27)

14a P_3 9-13 segments; cirri 9-17 (mostly 11-14) segments ..... ***Dorometra briseis*** (p. 28)

14b P_3 13-16 segments; cirri 10-14 (mostly 10-12) segments ... *Dorometra nana* (Hartlaub, 1890)

Localities and Specimens

The localities of dredged stations and the crinoid species collected are as follows. The bracketed numbers indicate a number of individuals.

St. 4. West of Tanegashima Isl., Satsunan Isls., 30° 30.70'N, 130° 44.40'E, 96 m in depth, dredge, 27 May 1999. No crinoid specimen.

St. 6. Hirase, north of Kuchinoshima Isl., (Tokara Isls.), Satsunan Isls., 30° 05.77'N, 130° 04.54'E, 96 m in depth, dredge, 28 May 1999. 2 species (2 specimens) were collected: *Comatella* sp. aff. *nigra* (1), *Phanogenia serrata* (1).

St. 7. Ohshima-Shinsone, north of Amami-Ohshima, Satsunan Isls., 28° 52.52'N, 129° 33.13'E, 158 m in depth, dredge, 29 May 1999. 3 species (3 specimens) were collected: ?*Comissia* sp. A (1), *Phanogenia serrata* (1), *Neometra multicolor* (1).

St. 9. South of Iejima Isl., west of Okinawa Isl., Ryukyu Isls., 26° 39.00'N, 127° 42.00'E, 95 m in depth, dredge, 30 May 1999. 2 species (86 specimens) were collected: *Phanogenia serrata* (1), *Decametra parva* (85).

St. 11. North of Tokashikijima Isl., (Kerama Isls.), Ryukyu Isls., 26° 15.80'N, 127° 21.90'E, 95-115 m in depth, dredge & sledge-net, 31 May 1999. 20 species (120 specimens) were collected: ?*Comissia* sp.B (1), *Phanogenia brevicirra* (1), *Comanthus alternans* (1), *Zygometra comata* (5), *Eudiocrinus venustulus* (48), *Eudiocrinus indivisus* (10), *Mariametra vicaria* (4), *Amphimetra laevipinna* (1), *Liparometra grandis* (2), *Basilometra boschmai* (1), *Alisometra owstoni* (1), *Decametra parva* (8), *Decametra multicirrala* (14), *Neometra multicolor* (3), *Asterometra anthus* (3), *Euantedon exquisita* (1), *Euantedon sinensis* (3), *Dorometra briseis* (3), *Dorometra parvicirra* (8), *Antedon parviflora* (2).

St. 12, South of Nagannu Isl., west of Okinawa Isl., Ryukyu Isls., 26° 14.50'N, 127° 32.00'E, 50-53 m in depth, dredge & sledge-net, 31 May 1999. Totaled 33 species (290 specimens) were

collected: *Comatella stelligera* (2), *Capillaster mariae* (2), *Capillaster multiradiatus* (72), *Alloeocomatella pectinifera* (6), ?*Comissia* sp. C (1), *Comatula pectinata* (6), *Comatulides* sp. aff. *decameros* (1), *Phanogenia multibrachiata* (1), *Phanogenia brevicirra* (8), *Comaster nobilis* (1), *Oxycomanthus exilis* (1), *Comanthus alternans* (1), *Comanthus parvicirrus* (18), *Comanthus gisleni* (2), *Zygometra comata* (13), *Catoptometra magnifica* (5), *Eudiocrinus venustulus* (1), *Eudiocrinus indivisus* (7), *Himerometra bartschi* (18), *Heterometra schlegelii* (7), *Amphimetra laevipinna* (1), *Oxymetra finschii* (1), *Stephanometra spicata* (1), *Liparometra articulata* (29), *Lamprometra palmata* (36), *Dichrometra doederleini* (17), *Alisometra owstoni* (13), *Colobometra discolor* (9), *Decametra parva* (4), *Decametra multicirrala* sp. nov. (2), *Euantedon sinensis* (1), *Dorometra parvicirra* (1), *Dorometra aphrodite* (2).

St. 13. East of Ukejima Isl., (Amami Isls.), Satsunan Isls., 27° 59.40'N, 129° 27.80'E, 128 m in depth, dredge, 1 June 1999. 7 species (13 specimens) were collected: ?*Comissia* sp. C (1), *Phanogenia serrata* (2), *Eudiocrinus loveni* (2), *Himerometra bartschi* (1), *Pterometra trichopoda* (4), *Asterometra anthus* (2), *Calometra callista* (1).

St. 14. East of Amami-ohshima, Satsunan Isls., 28° 05.10'N, 129° 27.80'E, 333-346 m in depth, dredge, 2 June 1999. No crinoid specimen.

St. 15. Southwest of Kikaijima Isl., Satsunan Isls., 28° 12.20'N, 129° 48.20'E, 220 m in depth, dredge, 2 June 1999. No crinoid specimen.

Additional station. South coast of Agunijima Isl., Ryukyu Isls., ca. 5 m in depth, diving, 2 species (2 specimens) were collected: *Comanthus parvicirrus* (1), *Oxycomanthus comanthipinna* (1).

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